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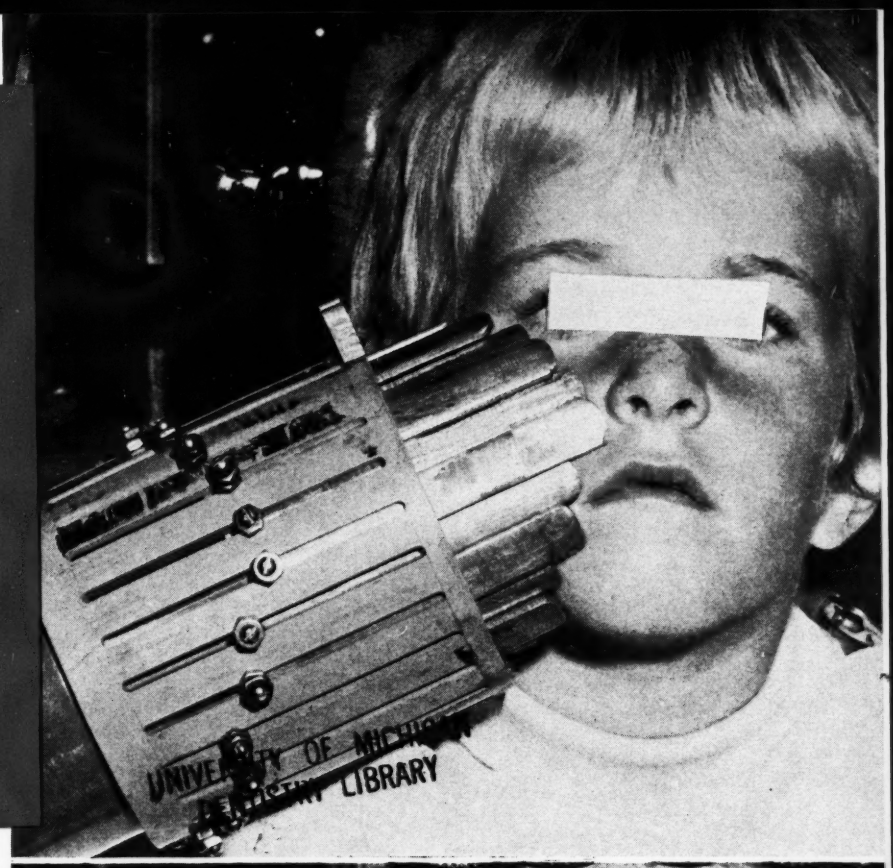
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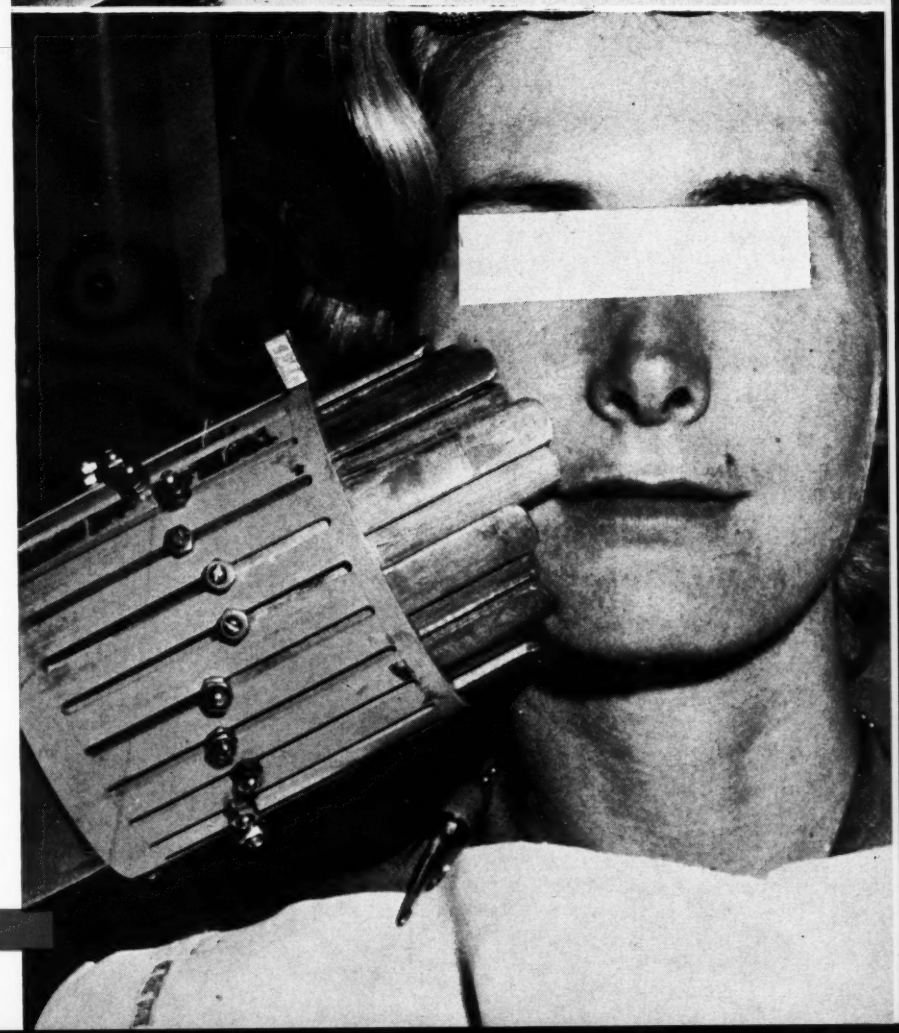

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SIDNEY ROSENBERG, D.D.S. (Chicago College of Dental Surgery, 1931; L.D.S., R.C.S., Eng., 1933 (Guy's Hospital) is practicing general dentistry in London. The second and final installment of his article, PRINCIPLES AND TECHNIQUES OF FIXED PROSTHESES, which is an adaptation of material that first appeared in the *British Dental Journal* in December 1959, appears in this issue.

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PETTER SKJORTEN, D.D.S. (Statens Tannlaegeinstitutt, Oslo, 1924) has published in Norwegian journals. Doctor Skjorten specializes in children's dentistry, treating only those between 7 and 14 years of age. His practice comprises 1,000 child patients a year. His first presentation in DIGEST is AN AMALGAM TECHNIQUE: CONTROL OF RESIDUAL MERCURY CONTENT which appears in the current issue.

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Reduction of RADIATION HAZARDS

CHARLES OKUN, L.D.S., D.D.S., Toronto, Canada

DIGEST

The greatest source of artificial radiation is the x-ray machine. In dentistry the x-ray film is a valuable diagnostic aid. The advantages obtained from the use of x-ray, however, are accompanied by hazards which have potentially increased since the use of nuclear fission.

Many cases of serious injury from radiation exposure have been reported. Among hundreds of others the author of this article, although he had never held film during exposure and had taken better than average precautions against exposure, has suffered radiation injury. He has therefore been actively concerned with the development of protective measures against the possible serious consequences of radiation exposure. This article describes an appliance he has developed and its specific uses in dental practice.

Possible Types of Damage from Radiation

Radiation can cause harm to human beings in several ways:

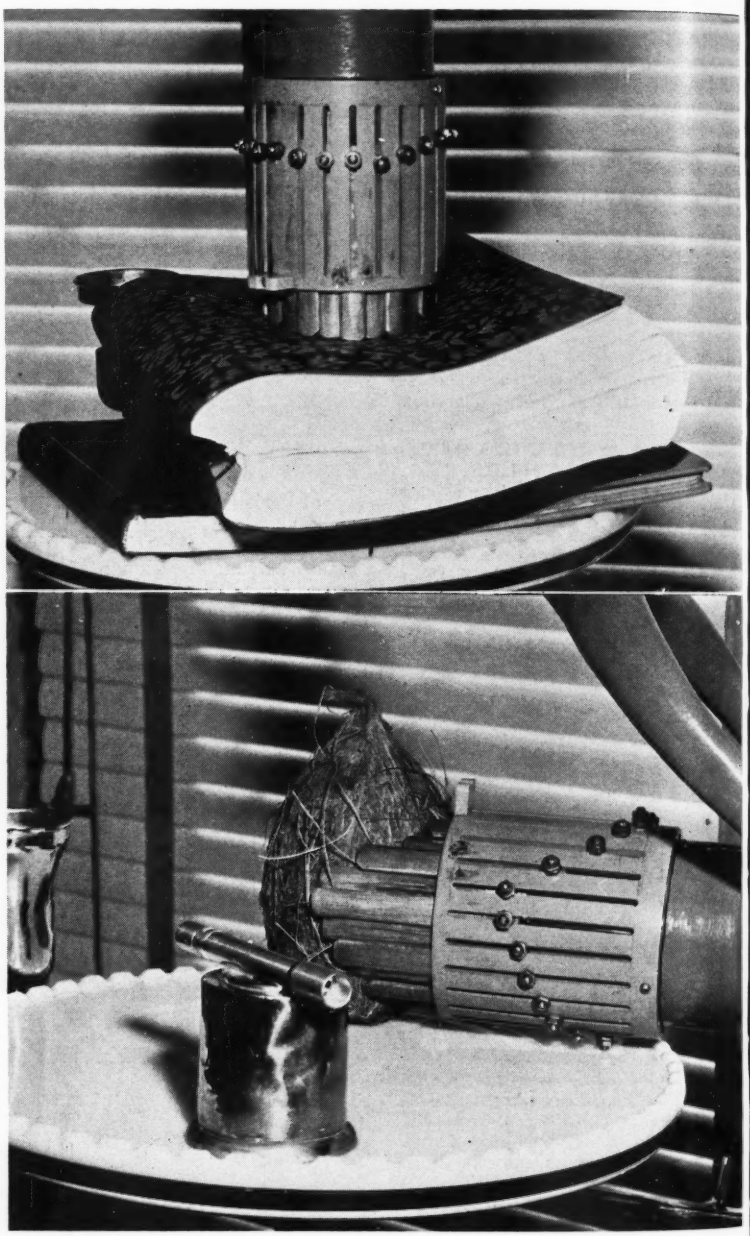
(1) Production of visible injuries such as carcinogenic cell damage to skin, lymphatic glands, bone marrow, gonads

(2) Shortening of the life span

(3) Genetic injury

(4) Death

Safety Measures Sought—Research has been undertaken by the United States National Bureau of Standards and other agencies for protection



1. (top)
The device is shown as it was used in Test 1 with a telephone directory as a phantom.

2.
As used in Test 3 with a cocoanut as phantom, and Dosemeter at a 45-degree angle at least six inches distant from the cocoanut.

Author's Note: Dental X-ray machine with an electronic timer, was used in all the tests.

Acknowledgements: Gratitude is expressed for the encouragement of the following persons: L. B. Leppard, Chief Physicist, Department of Health, Province of Ontario, Canada; Sholom Pearlman, Secretary, Council on Dental Research, American Dental Association; R. W. McNulty, Dean of the School of Dentistry, University of Southern California.

against the hazards of radiation. Recommendations have been made: the use of lead-lined rooms, cubicles, and similar barriers which shield only the persons on the other side of the defenses and are costly.

Modification of Machine Desired—It has been the author's conviction that the problem should be attacked at its source; namely, an alteration should be made in the machine producing the x-rays. In the search to provide a means to confine the random emanation of radiation from dental x-ray machines a small, compact device was evolved. This may be attached to the machine as a component part or as an accessory.

Protective Nozzle for X-ray Machine

The device originated by the author has the advantage of being easy to operate, small, economical to manufacture, and it protects *the patient, the operator, and the surrounding personnel.* The device has been used in personal practice for some time with excellent results.

Description of Device

The protective nozzle which will confine and control the spread of both primary and scattered radiation has an inner tube which extends its full length. The elongated slat members conform to the irregular outline of the patient. Both the inner tube and the slat members are made of an alloy impervious to x-rays. The device, which is equipped for precision positioning, is intended to replace the conventional plastic cone which is not protective, which acts only as a pointer, and has a deleterious effect on the final picture because of diffusion and secondary radiation.

Additional Strength Provided—The elongated slat members are interlocked for additional protection. The slats can all be extended their full length automatically before the apparatus is placed in position. With slight hand pressure, the slats will each conform to the irregular outline of the object being radiographed. The protective nozzle is held in this position if desired by the turn of a single screw on the x-ray machine. The knobs are for the purpose of controlling the tension of each slat and seldom need to be adjusted.

Limitation of Primary Rays—The device has provision at its machine end for filters and columinators. In the tests of the new instrument reported here two millimeters of aluminum and a lead doughnut-shaped diaphragm columinator were incorporated which limited the primary rays to 2.75 inches in diameter at the film distance.

Record of Results from Tests

The results of many tests over a period of time demonstrate that the device controls over 80 per cent of the emanation of radiation from the dental x-ray machine. The following are the results of some of the tests.

Test 1, *Figure* 1—Scattered x-rays measured approximately 1 meter from the scatterer with a Henson Electroscope, at right angles to the central axis, 8-inch target skin distance, using a telephone directory as a phantom, 4-second exposure, produced the following results:

Primary beam technique	Relative scatter intensity 1 meter from beam axis
1. Conventional plastic cone	42 spaces
2. New device	8 spaces

Test 2—Using a cocoanut as a phantom, a Henson Electroscope placed at right angles to the primary central beam, the following results were obtained:

Primary beam technique	Relative scatter intensity
1. Plastic cone alone, ½ second exposure	23 spaces (equivalent of 1400 milli-roentgen units per hour)
2. New Safe, ½ second exposure	No visible registration
3. New Safe, 10 second exposure	One-half of a space registration

Test 3, *Figure* 2—Using a cocoanut as a phantom, a Dosemeter was placed at a 45° angle to the phantom. The nearest point of the cocoanut in relation to the Dosemeter was at a distance of 6 inches.

Primary beam technique	Relative scatter intensity
1. Plastic cone alone	25 milli-roentgens
2. New Safe device	6 milli-roentgens

Test 4—Using a Dosemeter placed in line with the central axis of the primary beam, ½ second exposure, and at a distance of 1 inch the results were the following:

Primary beam technique	Dosemeter reading
1. Conventional plastic cone with 2 millimeters of aluminum filters, lead doughnut-shaped diaphragm inserted	20 milli-roentgens
2. Safe device	10 milli-roentgens

A Henson Electroscope was placed 1 meter distant from the patient with the x-ray machine on the right side of the patient, and a 10-second exposure in the following tests:

Primary beam technique	Relative scatter intensity
(A) *Test* 5, *Figure* 3—Electroscope at right angles to the primary beam, on the *right* side of the patient, and behind the head of the x-ray machine:	
1. Plastic cone alone	79 spaces
2. Safe device	7 spaces
(B) *Test* 6, *Figure* 3—Electroscope parallel to the primary beam and at the *left* side of the head of the x-ray machine, on the *right* side of the patient:	
1. Plastic cone alone	66 spaces
2. Safe device	8 spaces

(C) *Test* 7, *Figure* 4—Electroscope at right angles to the primary beam:

1. Plastic cone alone	150 spaces
2. Plastic cone with 2-millimeter aluminum filters and lead columinator	78 spaces
3. Safe device	37 spaces

Test 8—The following information was recently obtained with a Tracerlab Radiation Survey Meter. The manufacturer's recommended practical optimum position for the operator was selected, five feet from the skull phantom, at a 45 degree angle to the central beam axis, and at the same height as the central beam axis. Their newest dental x-ray machine was used with two lead columinators and 2.5 millimeters of aluminum filtration. Machine head and test meter were on the right side of the phantom. Current applied was 80 K.V.P. and 15 milliamperes.

Primary Beam Technique	Relative scatter intensity
1. Plastic cone	240 milli-roentgens per hour
2. New device	58 milli-roentgens per hour

Test 9—This was made at University of Southern California, Department of Oral Diagnosis. The same model machine as that used in Test 7 was employed.

Position from cocoanut phantom	Relative scatter intensity Milli-roentgen rate per hour	
	Plastic Cone	New Device
5 feet	250 milli-roentgens	60 milli-roentgens
8 feet	100 milli-roentgens	25 milli-roentgens

Discussion—Even with the most modern machine, as shown in Tests 8 and 9, the new device emitted less than 25 per cent of the radiation as compared to the plastic cone, thus making this position for the operator 400 per cent safer.

In Tests 5 and 6, at one meter, the safe device intensity comparison with the plastic cone, without filters and columinators, was even greater, less than 12 per cent, or over 800 per cent safer.

Comment

It should be noted that studies reveal that x-ray hazards have been under-estimated. Injuries continue to be reported. Minimizing the dangers will not safeguard or resolve the problem for the profession, office personnel, and the public.

Specific Advantges of Device

With the use of the new device less than 20 per cent of radiation hazard remains. Using the Radia-Tized film which is twice as fast as the regular film the hazard is reduced to less than 10 per cent. Using the ultra-speed which is twelve times as fast as the regular speed the hazard is reduced to less than 2 per cent.

Hazard may be Eliminated—Using the Safe device with Radia-Tized film more than 90 per cent reduction is obtained, and in using the new device with the ultra-speed film more than *98 per cent reduction is obtained.*

More Effective than Former Methods—The device with the two millimeters of aluminum and the lead doughnut-shaped diaphragm is up to 8 times as safe as the plastic cone in general use and should become part of every dental x-ray machine.

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3. (top)
The new Safe device is shown as it was used in Tests 5, 6, and 7.

4.
The new small compact device for reduction of radiation hazard is shown as it was used with a patient in Tests 5, 6, and 7.

PRINCIPLES *and* TECHNIQUES *of Fixed Prostheses:* PART TWO

SIDNEY ROSENBERG, D.D.S., L.D.S., London

DIGEST

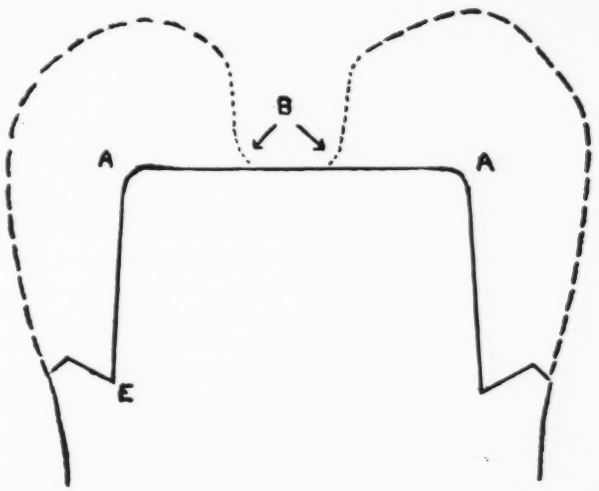
In this part, which is the second of two installments describing a method for the construction of a successful fixed prosthesis, the author discusses the operative technique employed, laboratory procedure, method of soldering the components of the bridge, and proper cementation. The problems of surveying the case and of cementation are presented in step-by-step detail.

Operative Technique

When the patient arrives for his next appointment the parallelometer is tried in the mouth, removed, and the following steps are taken:

(1) A rubber mouth prop is adjusted to allow the patient to rest his teeth and give the operator sufficient room to work comfortably.

(2) Under local anesthesia the abutment teeth are reduced occlusally the requisite amount, and the contact points are freed with diamond wheels and discs.

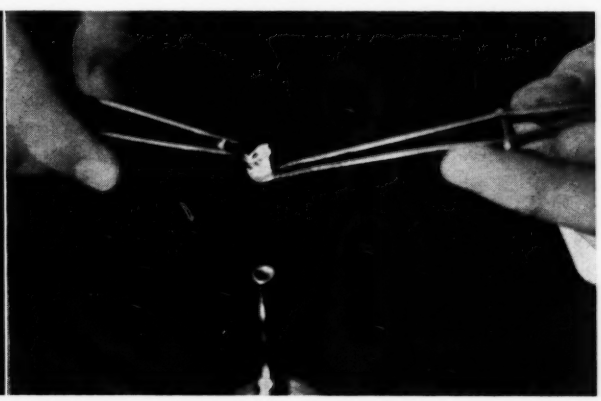


3.
Section through an MOD inlay preparation showing the reverse bevel on the gingival floor. The line angles at A and B should be rounded.

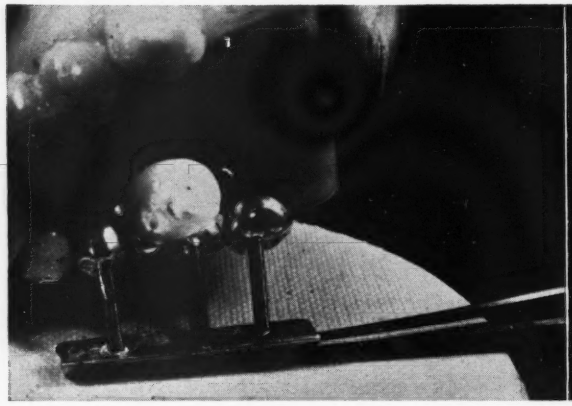
(3) The parallelometer is reinserted in the mouth and with its aid all grooves and fissures are cut in the direction predetermined in the laboratory.

(4) It may be possible to prepare all the abutments at one sitting, but should this be undesirable the use of the parallelometer makes it easy to prepare other abutments at subsequent

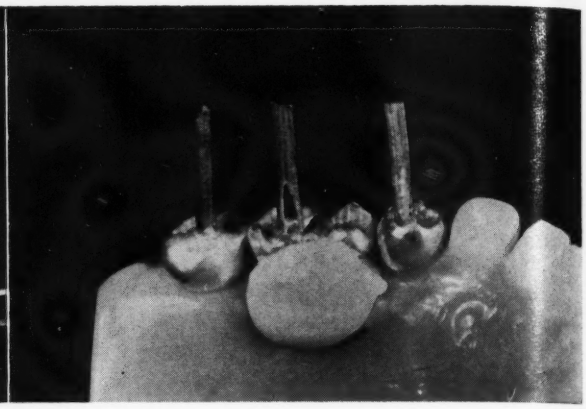
4.
These pontics have been cast with lugs which fit into dovetail cut in the retainers.



5.
Soldering the T bars to the retainers "freehand."



6.
The free ends of the T bars have been dipped in the soldering flux and are shown pushed into the molten solder contained in a piece of brass angle-bar held against an asbestos pad with a pair of heavy tweezers.



7.
The retainers and pontics on the model with the T bars attached. The pontics have been secured to the model with plaster.

sittings parallel to the earlier preparations without having to remove the temporary crowns or restorations, and the prosthesis can be prepared in stages with complete confidence.

(5) Before they are checked for parallelism and polished, the preparations have all the sharp angles slightly rounded; all, that is, with the exception of the cavosurface angles and those formed by the reverse bevel on the gingival floor and the axial walls.

(6) There is no virtue in these angles being sharp. Any line angles left sharp are reproduced in the model; those at "A" in Figure 3 are easily damaged. Those which would be sharp angles in the gold retainers (B, Figure 3) might shave off pieces of dentine during cementation and prevent the proper seating of the bridge. The angle at "E" must be sharp, as it resists the horizontal displacement forces. Because this angle is cut with a chisel it would be difficult to make it otherwise.

Accurate Model Essential—If the bridge is to be completed without recalling the patient, an accurate model in which the operator can have complete confidence is essential. Of all the types tried the most satisfactory so far have been the silver-plated models. Silver depositing can be satisfactory only on a dimensionally stable impression and one not affected by the electrolyte. Both the mercapton rubber base materials and the silicones can be silver-plated, the former immediately, the silicones only after standing for at least twenty-four hours. As both these materials undergo slight progressive shrinkage, plating should be started immediately and for this reason alone the mercapton rubbers would be preferred. In addition, they are easier to handle than the silicones as they give a longer working time.

Preparatory Steps—1. Prior to taking the impression, the gingival crevice is packed with thin strips of adrenalin gauze or wisps of cotton wool soaked in 1:100 adrenalin.

(2) After a few minutes these are removed and, if necessary, repacked until the gingival margin is visible and there is no bleeding.

(3) A tray has been made to fit the whole arch (constructed of expanded metal covered with baseplate material or acrylic lined with adhesive), as it is desirable that the model on which the bridge is to be constructed should include all the teeth in the arch.

(4) The assistant mixes the impression material and fills the syringe while the operator dries the field, particularly the gingival crevice.

(5) The impression material is injected around the preparations with a spiral action, gingivo-occlusally, to eliminate air bubbles.

(6) The material tends to sag away from the preparations and, to keep this to a minimum, a little material is smeared on to the dried mucous membrane buccally and lingually just above the gingival margin prior to injection. The injected material sticks to this and is less likely to run.

Completing the Impression—(1) The preparations having been covered, the tray, which has been filled by the assistant, is carried to place.

(2) When the material has set the impression is removed and examined and if satisfactory it is sent to the laboratory where it is washed and dried.

(3) An alginate impression of the opposing teeth is taken and wax registrations obtained of the relationships of the upper and lower teeth in various positions.

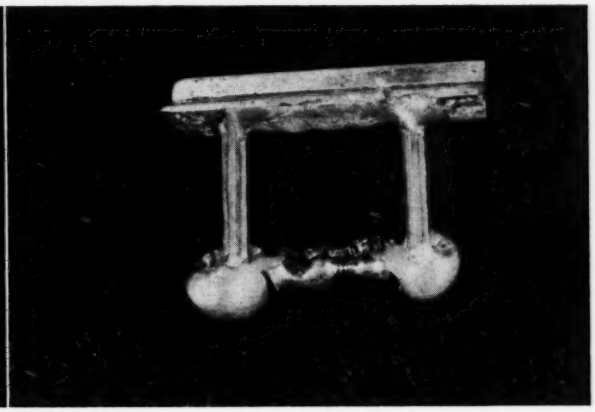
(4) For an anterior bridge, records of the centric, lateral, and edge-to-edge positions are required; for a posterior one, centric and lateral will usually suffice.

Laboratory Procedure

If Kerr's Permlastic® is used it should be plated immediately: if it is left until the following day before being plated it will be found that the silver has a marked tendency to stick to the rubber instead of the plaster when the impression is removed from the model. The silicones should be left for twenty-four hours before being touched. The procedure is completed in the following manner:

1. Silver powder is rubbed into the preparations and any other part of the impression, such as contact points,

8.
The connecting brass angle-bar has been soldered to the T bars but pontics rest securely in the grooves cut in the retainers and do not require a T bar of their own.



9.
The bridge assembly withdrawn from the model. The pontics are secured to the retainers with sticky wax.

where hard metallic surfaces on the model are required.

2. Thin copper "flex" is pushed into the impression, near the parts to be silvered but sufficiently far away to eliminate any danger of distortion. Two or more wires may be required depending on the number and proximity of the abutments.

3. The wires are waxed to the impression with sticky wax; all surfaces of the tray and the parts of the wire not covered with insulation are painted with molten baseplate wax and placed in the electro-depositing bath.

4. Care should be taken to avoid distorting the impression by resting a thin flexible flange on the bottom of the tank, or by hanging the impression by the wire.

5. Allow time for an adequate layer of silver to be deposited. Thin layers may peel off the plaster model.

Accurate Occlusion Established—Before articulating the model its base is keyed and slightly tapered, and a separating medium applied. It is then occluded to a model of the opposing teeth by means of wax registrations and the study models. It may be necessary to trim away small bubbles on the occlusal surfaces of the posterior teeth or slight distortions but it is essential that the occlusion be established accurately.

Recordings of Positions Necessary—In mounting the models on an articulator, face-bow recordings may be used but are not essential for smaller bridges. However, recordings of various positions previously mentioned are necessary. The time required to record them is negligible, and the time saved by so doing, enormous.

Final Steps

1. Knock the working model out of its plaster base on the articulator, cut through the model between the end abutment teeth and those adjacent to them. This will enable the gingival margins of the preparations to be exposed by careful trimming away of the deflected gingivae using true-running carbo discs.

2. Powerful magnifying glasses should be used and the model should never be split between the abutments. The model being keyed should go back into its matrix with sufficient precision to enable the contact points to be established accurately.

3. Wax up retainers first but fit the pontics before casting them, as it will often be necessary to adjust the approximal surfaces of the retainers to accommodate the pontics. This can be done more easily and with greater safety in wax than in gold.

4. Occasionally it may be desirable to reduce the opposing natural teeth to accommodate a pontic. The patient should be advised beforehand that some balancing of the bite may be necessary.

5. Cast the retainers before the pontics, put them back on the model and check the occlusion; in the marginal ridges approximating the pontics cut rests, square in cross section, with a No. 4 fissure bur held parallel to the long axis of the tooth.

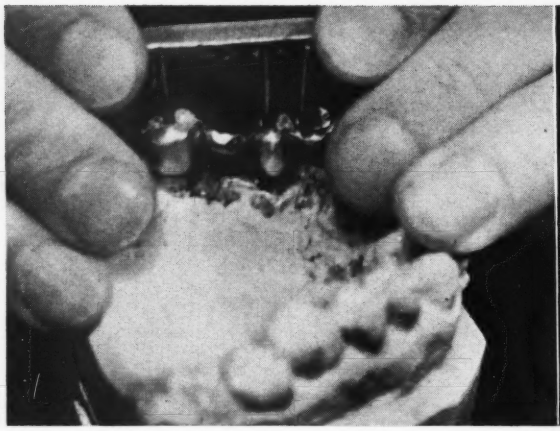
6. Extend the waxing of the pontics into these rests. When the pontics are cast they will rest in the abutments. This makes for a much stronger soldered joint and facilitates the manipulation of the components of the bridge prior to soldering (Fig. 4).

Transferring the Bridge Components for Soldering

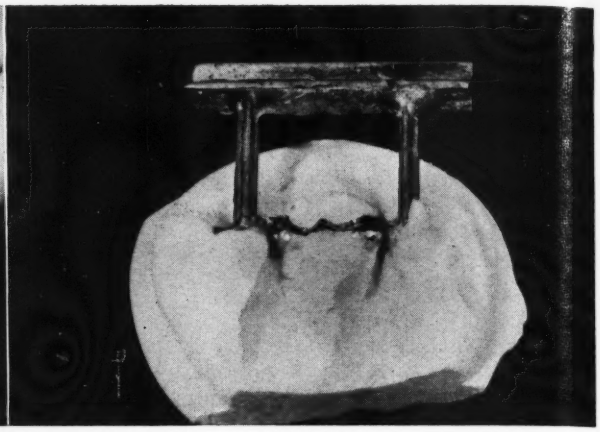
It is during this manipulation that the major errors occur, those of alinement. Slight high spots in occlusion or tight contacts can be corrected in the mouth should they occur, but any alteration in the relationship of the abutments during assembly and soldering results in failure.

Distortion may be Observed—Using a one-piece metal model, distortion occurring during the removal of the parts of the bridge for soldering and during the soldering process can be fairly easily observed unless the abutment teeth have been mutilated to facilitate the removal of the bridge components for soldering.

Mobility may be Impaired—Usually the castings fit the abutments so snugly that withdrawal of all the components *en bloc* in the usual manner is difficult and fraught with danger. Assembling the castings in the mouth, taking a plaster impression, piecing that together and then removing the



10.
This shows a bridge assembly different from those shown in Figure 9, being drawn off the model after the step shown in the illustration and prior to investing.



11.
The bridge component invested. Before they can be soldered the T bars must be severed well below any vestige of soft solder.

castings from the teeth and into the impression, permits many small errors to creep in unobserved.

Technique

To eliminate all possible errors, the following technique was devised and has proved simple, uniformly successful, and virtually foolproof.

1. A piece of cast white gold T bar not shorter than ¾ inch in length is soldered with a low carat gold solder to each retainer at about the center of the occlusal surface in the case of molars or bicuspids or just below the incisal margins in the case of three-quarter crowns or pinlays on anterior teeth (Fig. 5). Orthodontic tubing may be used instead of T bars.

2. The bars should be as near parallel to each other as possible and in line with the path of insertion of the retainers.

3. With the bars in position, the retainers are replaced on the model and a piece of heavy brass cut to fit across the ends of the wires. A piece of angle brass cut from a curtain rail is suitable as soft solder can be melted into the angle.

4. With the brass held in a pair of heavy tweezers the solder is melted into the angle of the brass and while the solder is molten the model is lifted and the ends of the T bars dipped into flux and then into the solder, where it is held until the solder hardens (Fig. 6).

5. Procedure varies slightly depending on the fit of the retainers. If tight, proceed as above. If loose, hold retainers and pontics in place with acrylic (Fig. 7).

6. Often only the retainers need be soldered to the brass connecting bar (Figs. 8 and 9). The pontics can be fastened to the retainers with acrylic or wax, but a pontic which is to be rigidly attached to only one retainer should have its own T bar.

7. With a large prosthesis in which, owing to the curvature of the arch, all the rods cannot be brought into line, a curved brass bar can be used and any T bars which are not immediately united to the brass bar by the method described can be soft soldered with a soldering iron.

8. When the abutments fit tightly, the model should be pressed securely to the bench by an assistant, the bar held at the ends, and lifted smoothly in the direction of the line of insertion, indicated by the T bars (Fig. 10).

Soldering

The components are now invested for soldering leaving the T bars and brass bar clear of the investment (Fig. 11).

Wires Severed—When this is quite hard a carborundum disc is used to sever the wires well below the soft solder, and the brass bar and all the soft solder is carefully removed before soldering the bridge, for if any attempt were made to solder the bridge before doing so, the soft solder, even if it were covered with investment, would run on to the gold castings and ruin them.

On no account must cutting pliers be used to sever the T bars.

Depth Increased—By extending the solder joint gingivally, its strength increases far more than if extended buccolingually.

Adequate depth of the soldered joint is ensured by extending the groove cut in the retainers (described earlier) as far as possible gingivally. But the joint must not infringe on the gingival tissues and there must be sufficient room to allow the area to be cleaned easily.

Finishing

When the bridge is returned to the model what is left of the T bars is removed, and the occlusion checked again. The bridge is given its final polish and the facings attached.

Appliance Tried—At the next visit the temporary crowns and dressings are removed and the preparation lubricated before the appliance is tried in. Because of the slight mobility of the natural teeth, the appliance should seat more easily in the mouth than on the model.

Excessive Contact May Occur—Any difficulty experienced is usually due to excessive contact, which may be due to faulty manipulation of the parts of the model or to drifting of the teeth in the mouth. This is more likely to

occur when one of the abutment teeth is the penultimate one in the arch and the temporary crowns do not properly restore the contact.

Effect of Inadequate Contact—The opposite effect, inadequate contact, may be due to the temporary restorations being too tight or being wedged interproximally by the opposing teeth, causing a temporary separation. Any drifting together of the abutments due to this cause or the recent loss of the tooth or teeth being replaced can seldom be sufficient to prohibit their repositioning by the forcible insertion of the appliance.

Solder May be Added to Contact Point—Should drifting of a contacting tooth be envisaged, or if for any reason it is thought there might be insufficient contact, the porcelain pontics should not be cemented until the appliance has been tried in the mouth and any discrepancy corrected by adding solder to the contact point.

Appropriate Corrections—1. Too tight a contact can be corrected by judicious grinding. These must be corrected before cementation.

2. When reducing the occlusal surface of a retainer the thickness of the gold should be measured from time to time and it should never be ground thinner than the amount of tooth structure removed during the preparation of the abutment tooth.

3. If sufficient clearance has been effected during the preparation, a slight discrepancy in the bite at this stage may be due to tooth movement.

4. Properly fitting temporary metal crowns over the preparations will eliminate or reduce this type of error, but in every case the treatment should be completed as expeditiously as possible.

5. After wearing the bridge for twenty-four to forty-eight hours the abutment teeth should be back in their original positions.

6. Prior to cementation, all traces of lubricating oil used during the try-in are removed with chloroform.

Cementation

To enable cementation to be effected expeditiously, the cement should be conveyed to the preparations by means of a large Jiffy tube filled with cement. This is particularly helpful in the upper jaw. While it is being done the assistant is filling the retainers.

Removal of Hard Cement—To facilitate the removal of the hard cement from the pontics those portions in contact with the mucous membrane should be painted with petroleum jelly prior to cementation, great care being taken to keep the jelly from touching anything to which the cement must adhere.

Precautionary Measure—A bowl containing a solution of bicarbonate of soda should be at hand in case the cement begins to set before the bridge can be seated. If difficulty is experienced the bridge can be dropped in the solution and the solution can be syringed or swabbed on to the unset cement on the preparations. This facilitates the removal of the cement and enables the operator to start again.

To Facilitate Escape of Cement—As the restoration is seated, the cement is expressed around the margins of the castings at first with facility but with increasing difficulty as the space between gold and tooth decreases. To facilitate the escape of the cement around the necks of tightly fitting crowns, a couple of grooves can be cut in the fitting surface from the occlusal to within a millimeter of the gingival margin, or a small hole can be drilled through the occlusal surface through which the cement can escape. This hole can be filled with gold foil, a gold inlay, or a soft gold wire of the same diameter as the hole.

Caution—It is all too easy to trap wisps of cotton rolls or the edge of a gauze square under the edge of a retainer with disastrous results.

Minimum of Cement Left—Provided no air is trapped in the cement, the cement is thin, and the appliance is seated before the cement begins to set, the amount of cement left between the gold and the prepared tooth should be the minimum, about two-thousandths of an inch.

Pressure Applied—After the bridge has been pushed down by hand and given a few taps with an automatic mallet, a wooden block should be placed between the bridge and the opposing teeth and the patient asked to bite hard. The block should be trimmed to avoid pressure on porcelain facings. Once the bridge is properly seated, pressure need be maintained no longer but the cement should be protected from moisture until it is hard.

High Spots Corrected—When all the surplus cement has been removed the occlusion is checked again in all positions and excursions of the mandible, but slight high spots should not be corrected at this stage. If the gold occlusal surfaces are left with a matt finish and not given a high glaze at this stage, the high spots will be clearly visible twenty-four hours later when, indeed, it will be found that in most cases the occlusion is comfortable and needless mutilation has been avoided.

Summary

The principles enumerated and the description of retainers and pontics are necessarily brief and incomplete. The methods of surveying and soldering are described in more detail, and the author has found them to be most helpful and accurate.

Adapted from *British Dental Journal* **107**:379 (Dec. 15) 1959.

A NEW CHEMOTHERAPEUTIC APPROACH

to the Treatment of Gingival Tissue

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DIGEST

This article reports the clinical observations concerning a new dental therapeutic preparation. A description of the action of the principle ingredients in the preparation is presented as well as a report of the clinical progress of 49 patients in which the drug was used for the treatment of different types of gingival inflammation and infection.

General Factors Pertaining to Gingival Disorders

Dental practitioners are aware of the high incidence of soft tissue disorders. It is estimated that over 80 per cent of the nation's population is afflicted with varying degrees of periodontal disease.[1] The development of therapeutic agents has been largely directed to the physician; the dental profession has not been as well supplied with new and efficacious products for the treatment of disorders in the oral cavity.

Composition of New Drug—This is a report on the use of a new preparation*** formulated for topical application to the oral mucosa. The major chemical constituents are a unique zinc salt involving a complexation phenomenon; 3.5 milligrams of neomycin base per gram, present as the sulfate; 3 per cent isobutyl p-amino-benzoate; and a 1 to 1000 concentration of benzalkonium chloride. These are incorporated into a specially designed glycerite base.

Indications for Use—The formula is valuable in painful or infectious conditions ranging from acute necrotizing gingivitis through suppurative periodontitis. Important features are (1) the therapeutic utilization of a new complexed zinc salt on gingival tissue, and (2) the inclusion of neomycin, an antimicrobial agent, demonstrated to be of value for topical use.

Astringency and Complexation

The action of a zinc salt manifests itself primarily as a result of ionization of the salt into its constituent ions. The causative astringent factor is the zinc ion which induces precipitation of proteinaceous material.[2] There is no discrimination between human and bacterial protein; it is possible therefore to obtain bacteriocidal and bacteriostatic activity as well as astringency. The more completely dissociated the salt, the more rapid and intense is the reaction with protein. Hence the highly ionized zinc salts can cause adverse side effects, such as irritation and tissue necrosis, depending on the concentration utilized. Continued use directly on sensitive mucous membrane might therefore produce side effects in conjunction with the beneficial astringent and antiseptic action.

Principle of Complexation — A method of separating the undesirable actions by prior complexation of zinc ions has been used in pharmaceutical preparations for years and can markedly influence biologic action. Complexation is the interaction of the reactive zinc ions with a suitable physiologically compatible chemical receptor which results in the formation of a complex salt in which the zinc ions are held in a slightly ionized state. In the complexed state the full astringent potential is not immediately released to the tissues but a more gradual and prolonged action is possible.

Application of Principle—The local action of silver nitrate is complicated by irritation and corrosion.[3] In an attempt to produce substances having the desirable properties of silver salts but free from the objectionable action of the nitrate, compounds containing silver combined with protein have been prepared. By this process, conversion of the highly ionized silver salt to a slightly ionized state is accomplished due to binding of the silver ions. One of the best known of these preparations is Mild Silver Protein N.F.[4], a close approximation of which is commercially available under the trade name of Argyrol®.

Advantages of Mild Silver Protein Preparation—The striking alteration in activity is revealed by the fact that Silver Nitrate Ophthalmic Solution U.S.P.[5], containing 1 per cent silver nitrate is applied to the conjunctiva with caution whereas Mild Silver Protein can be used for eye instillation in concentrations as high as 25 per cent. In addition to being nonirritating, Mild Silver Protein preparations can be more frequently applied ensuring more continuous action.

Analagous Situation—In the case of zinc complexation and the local action

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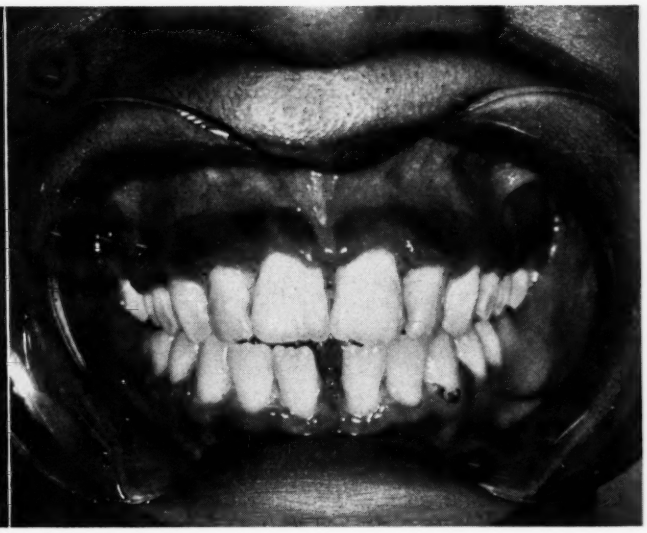
***Bio Gum-Kare® supplied by Crane-Hall Corporation, Washington, D.C.

[1]Marshall-Day, C.D., et al.: Incidence and Prevalence of Periodontal Disease, J. Periodontal. **26**: 185 (July) 1955.
[2]Goodman, L. S., and Gilman, A.: The Pharmacological Basis of Therapeutics, ed. 2, New York, The Macmillan Company, 1955, p. 1107.
[3]Sollman, T. H.: A Manual of Pharmacology, ed. 8, Philadelphia, W. B. Saunders Company, 1957, p. 1293.
[4]The National Formulary, ed. 11, Philadelphia, J. B. Lippincott Company, 1960, p. 326.
[5]Pharmacopeia of the United States, sixteenth revision, Easton, Mack Publishing Company, 1960, p. 644.

1.
Vincent's infection; before treatment.



2.
Vincent's infection; one day after treatment.

on mucous membrane the situation might be expected to be analagous. The chemical receptor, in this case, is non-proteinaceous in character but of medicinal merit locally. The utilization of complexation avoids the irritation and escharotic disadvantages usually attributed to zinc salts, without detracting from its therapeutic benefit.

Activity Prolonged—The presence of zinc complexes of varying stability encourages a prolonged duration of activity. Saliva samples to which a test solution was added were tested before and after the application of the formula. Preliminary studies indicated a contact time of between three and four hours with a single application. Additional testing is being done and results will be reported later.

Other Complementary Ingredients

Fortification with a suitable antimicrobial agent increases the versatility and value in the case of infectious periodontal disease. For the control of local infections of the oral cavity, neomycin appears to be the drug of choice and is contained in the formula.

Some Characteristics of Neomycin—

1. Neomycin has a wider antibacterial spectrum than most antibiotics.[6]

2. Neomycin is rapidly bactericidal, a valuable characteristic.[7]

3. Neomycin has rarely, if ever, caused hypersensitivity reactions in extensive local use. This is in contradistinction to such agents as penicillin and bacitracin when used locally.[8]

4. Cross resistance between neomycin and penicillin, tetracycline, chloramphenicol, and erythromycin does not occur.[9]

5. Organisms do not become resistant to neomycin while the drug is be-

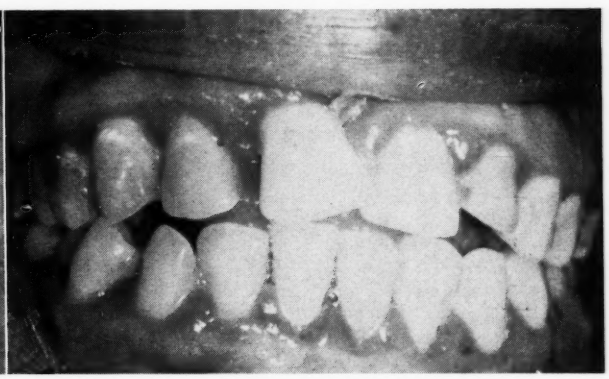
[6]Waisbren, B. A., and Spink, W. W.: Comparative Action of Aureomycin, Chloromycetin, Neomycin, Q-19, and Polymyxin B Against Gram Negative Bacilli, Proc. Soc. Exptl. Biol. M. **74**:35-40 (May) 1950.

[7]Ibid.

[8]Waksman, S.: Neomycin, Its Nature and Practical Applications, ed. 1, Baltimore, Williams and Wilkins Company, 1958, p. 168.

[9]Ibid., p. 166.

3.
Marginal gingivitis in pregnancy.



4.
Marginal gingivitis in diabetes.

5.
Gingivitis in granulocytic leukemia.

6.
Early Vincent's infection in a child.

ing used topically to treat an infection.[10]

6. Topical applications of neomycin in various nasal and otic infections have produced no side effects.[11]

7. There is general agreement that the index of sensitization for neomycin is extremely low.[12]

8. Neomycin is reported not to be inactivated by exudates, enzymes, or products of bacterial growth and through its antibacterial action appears to promote healing.[7]

Effectiveness Increased—Additional benefits may be achieved from the use of neomycin when it is incorporated into a dental formula in which the prolonged action of complexed zinc ions can be utilized. Its incorporation reveals no chemical or pharmacologic incompatibilities and by its tenacious adherence to the area of application, a prolonged local contact of the antibiotic results. This is in contradistinction to other types of local antimicrobial preparations, and results in a rapid reduction in oral sepsis. This characteristic presents a logical rationale for the prevention of systemic bacteremias,[13] originating in the oral cavity, and its use would appear to be indicated for effective local treatment in many types of periodontal and oral infections.

Other Ingredients Included—Benzalkonium chloride, 1:1000 concentration, and a 3 per cent concentration of isobutyl p-amino benzoate are indicated for use as an effective germicide, detergent, and wetting agent suitable for application to mucous membrane and a quick acting local anesthetic suitable for the alleviation of pain.

Clinical Observations

Periodontal diseases may be treated in a variety of ways; in general, however, treatment consists of relieving painful symptoms (when present) of the bacterial phase and correcting local and systemic predisposing causes. Drug therapy, instrumentation, and correction of local etiologic factors by the dentist are essential.

Tissue Repair Encouraged—Drug therapy in the form of the dental formulation described has been used clinically in 49 cases with promising results. An example of the prompt tissue response to its antibacterial and astringent action is shown in Figure 1 which is that of a twenty-one-year old woman with the typical symptoms of acute ulceromembranous stomatitis. Treatment for twenty-four hours by topical application every half-hour results in the improvement shown in Figure 2. Similar results have been observed in other cases with the same symptoms. Repair of tissue and elimination of bacterial invasion have been shown to be enhanced by use of this formulation.

Evaluation of Cases Treated—The best results were seen in the treatment of bacterial invasion such as Vincent's infection, periodontitis, and in infectious stomatitis. In fifteen cases of Vincent's infection treated within a two to three-day period, all except one responded favorably. Of twelve cases of infectious stomatitis, nine responded favorably within three days of treatment. Twenty-two cases of periodontitis showed considerable diminution of acute symptoms, such as inflammation, swelling, and pus, after three to four days of treatment.

Method of Treatment—Originally the patient was instructed to present himself at the clinic every day for four days for application of the medication. The patient was given instructions in gum massage and oral hygiene for self treatment at home. Later the method was modified and those with acute conditions were given a tube of medication to take home with instructions to apply to the gingival tissue with a cotton applicator every half hour during the waking day. They were requested to return every second day for evaluation and observation. A more favorable response was obtained from this method than from the former.

Summary

1. A new and promising dental formulation involving a unique alteration of the astringent potential of zinc salts by complexation is now available to the dental profession. The formulation includes a local anesthetic for the amelioration of pain, and neomycin and

(*Continued on page* 236)

[10]Ibid., p. 158.
[11]Lazar, A. M., and Goldin, M.: Experiences with Aqueous Neomycin Preparations in Nasal and Otic Infections, Antibiotics Annual 1954-5, Medical Encyclopedia, Inc., New York, pp. 468-73.
[12]Council on Drugs of the American Medical Association, JAMA **154**:338 (Jan.) 1954.
[13]Shelanski, M.: Personal communication.
[14]Waksman, S.: Neomycin, Its Nature and Practical Applications, ed. 1, Baltimore, Williams and Wilkins Company, 1958, p. 299.

STAINLESS STEEL CROWNS

and the Child Patient—PART ONE

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DIGEST

This is the first of a series of four articles dealing with the subject of the child patient who requires stainless steel crowns. In this installment, after an explanation to the parents of the fundamental necessity for the construction of crowns in the young patient, the step-by-step procedure employed to complete the technique is presented. The important factor is speed gained by coordinating the activity of the dentist and his assistant, and by eliminating needless steps in the procedure. This method has been found to promote patient satisfaction and more efficient utilization of time.

Crown Selection and Preparation (Five Minutes)

This phase of the technique includes the following steps:

1. After anesthetic has been administered as required select a crown the proper size. Experience and practice will aid in this choice. If the crown fits snugly at the neck of the tooth it is the correct size.

2. With crown scissors make a continuous cut completely around the crown.

3. Replace the crown and examine for gingival impingement by noting blanched areas on the gingiva.

4. Make a second cut to remove the impingement and replace the crown.

5. Remove again and make a cervical crimp with pliers K-114 and No. 137. It is preferable to go all around the neck of the crown with pliers K-114 first; then try the crown and make the fine adjustments with a plier No. 136. Place the crown to one side.

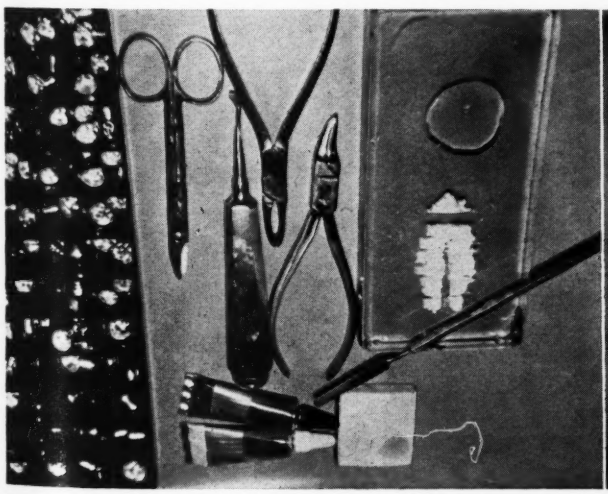
Tooth Preparation (Five Minutes)

Experience has shown that the easiest, quickest, and most convenient method of preparing the tooth with either higher speed or slower speed handpieces is to use a fissure bur for initial cutting. This bur will remove most of the caries and the deep grooves permitting ready access to the more remote areas of the tooth with the large cherry bur. Hand instrumentation may then be used if necessary. As this phase is nearing completion the assistant should have the base medication and cotton rolls ready. Apply the medication and immediately (in the case of Cavitec® which the author uses) have the patient close his mouth. The oral heat rapidly sets the base material.

Cementation (Two Minutes)

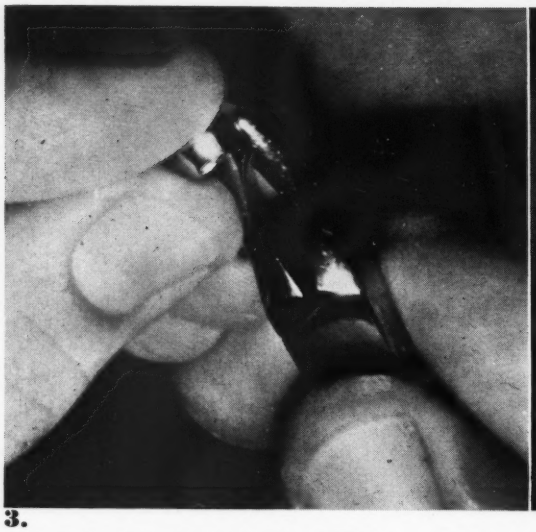
1. While the base sets the assistant may prepare the cement.

2. When it is mixed, as the assistant fills the crowns with soft cement, place cotton rolls in position and dry the tooth.

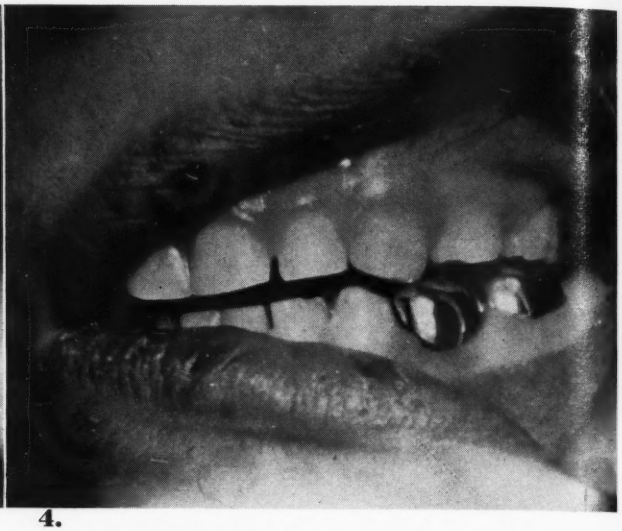


1.
Armamentarium for stainless steel crowns: crown assortment, crown scissors, band pusher, pliers K-114, pliers No. 137, cement materials, and sub-base materials.

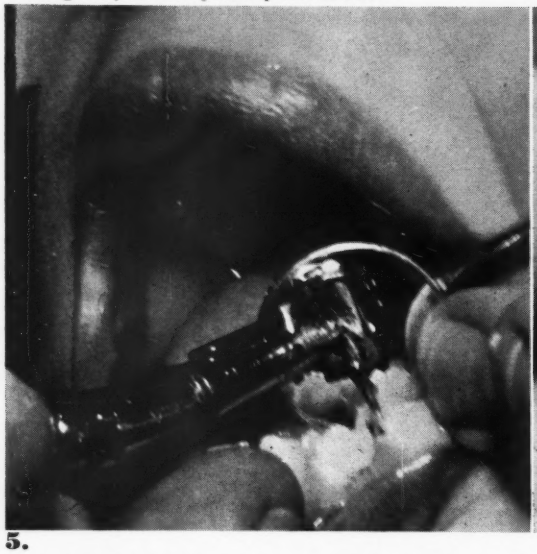
2.
Making the first cervical cut.



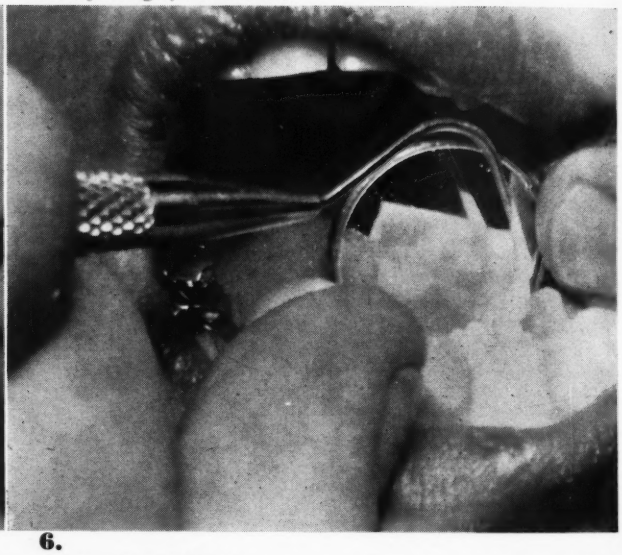
3.
Making the first crimp with pliers K-114.



4.
First placing of the crowns.

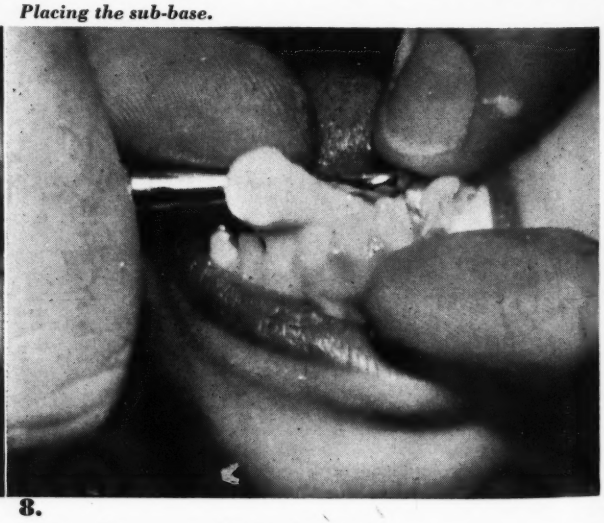


5.
Removing the caries.



6.
Placing the sub-base.

7.
Filling the crown with cement.



8.
Seating the crowns with a band pusher.

9.
Finishing the final seating with jaw pressure.

10.
Crowns after cleaning.

3. Press the crowns to place with a band pusher.

4. Correct the occlusion by firmly pressing the lower jaw against the upper until proper occlusion is re-established. Have the patient hold this position for three to five minutes.

Cleaning the Crown (Two Minutes)

1. With a No. 23 explorer remove the excess flash cement.

2. Wipe the crown with a pledget of cotton.

3. Have the patient rinse the mouth.

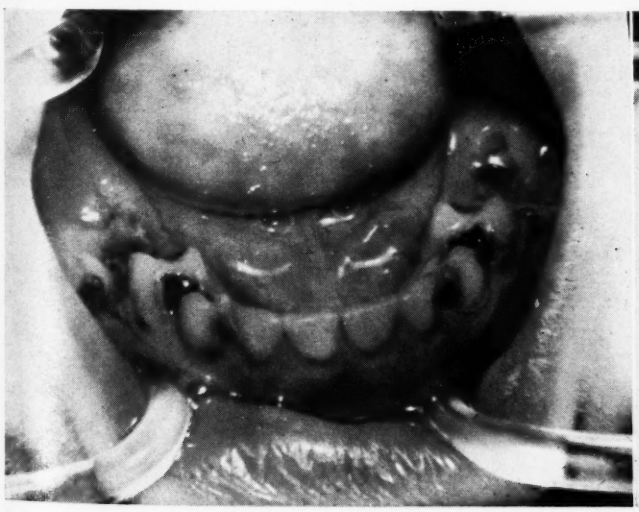
Parent Information

Before the child leaves the office with new steel crowns it is wise to inform the parents that the young patient must avoid all sticky foods and gum. Mastication of sticky substances can pull off a crown. Caramels and foods equally resistant can displace large restorations. A word of caution therefore will be advisable to prevent traumatic stress to the newly restored tooth. The loss rate in these cases has been extremely low; 1 to 2 per cent at most. With adequate cementation and proper crimping of the crown at the gingival, the crown may be expected to remain in place despite intake of sticky foods.

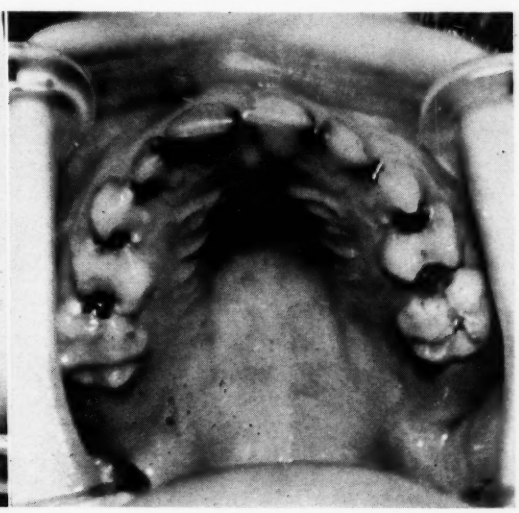
Quadrant Crown Construction

One of the most valuable features of stainless steel crowns is the relative ease with which multiple crowns may be placed in the same quadrant. In practice, it takes a little more time or effort to complete two or three crowns in a quadrant than it does to complete the single crown. Anesthesia problems are simplified, chair time is reduced to a minimum, and savings are realized on materials.

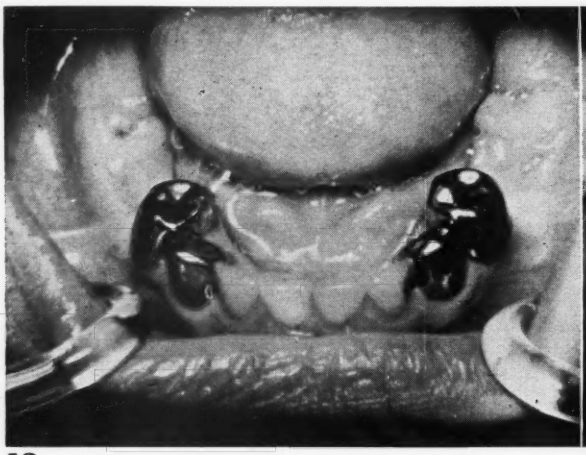
These savings are a financial advantage to the dentist by increasing his profit margin and rendering his chair



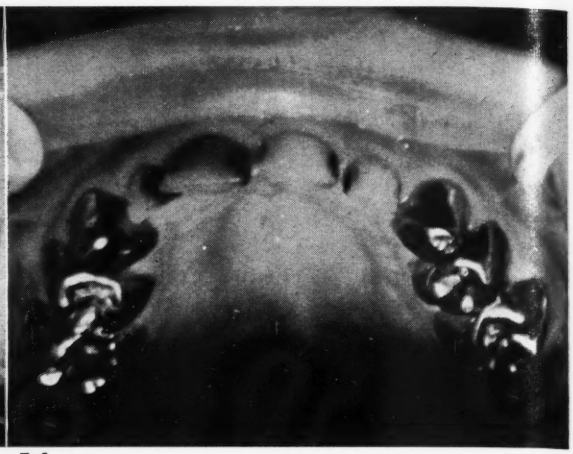
11.
Five-year-old child with rampant mandibular deciduous caries.



12.
Same child as shown in Figure 11 showing rampant maxillary caries.



13.
Mandibular caries treated with stainless steel crowns. Note previously extracted second deciduous molars



14.
Maxillary caries treated with stainless steel crowns.

time more remunerative; they also aid in controlling behavior reactions: (1) Children will need less extensive periods of operative dentistry, (2) they will be able to cooperate better in a brief appointment; the young patient's pleasure in a shorter dental appointment stimulates his will to cooperate.

Morning and Afternoon Appointments

Children sometimes have to travel considerable distance for dental appointments. Time and travel may limit the number of appointments possible. For a child who must have all primary molars crowned four appointments have been found to be adequate. But because of factors of time and travel a child who has one appointment in the morning may have another in the afternoon. The noon break for lunch encourages him to forget the unfamiliar aspects of dentistry and food replenishes the blood sugar levels for favorable response to treatment. Although this is not the ideal schedule for appointments it does have definite practical advantages.

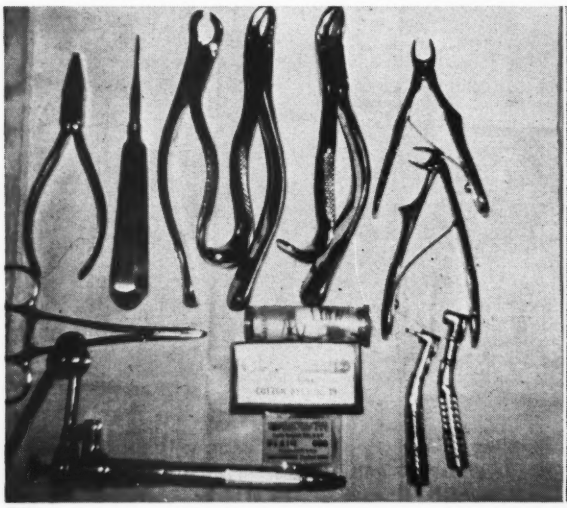
Hospital Appointment for Restorations

Many patients with rampant caries are so young that office treatment is unsatisfactory and often impossible without extreme measures. In such cases hospital treatment should be considered.

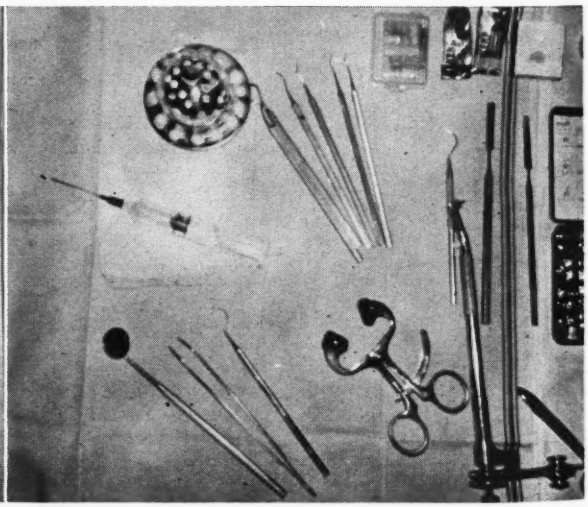
Under general anesthesia steel crowns are placed in much the same manner as in the office. The same methods are employed to speed operation in order to reduce the duration of anesthesia. This is a benefit to the child for speed and proficiency reduce both trauma and cost.

Summary

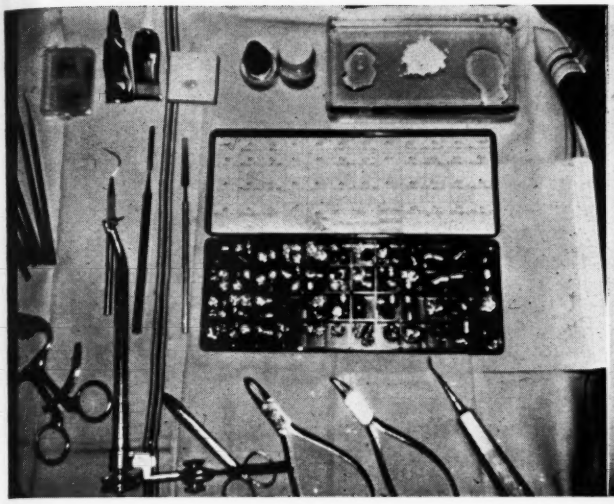
No advance in pedodontic technique since the introduction of local anesthesia offers the dentist a better oppor-



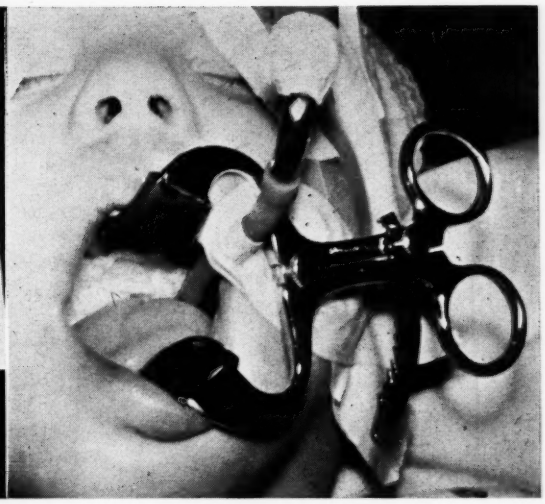
15.
Armamentarium for hospital procedures arranged on a Mayo



16.
stand (Figure 15) and on one mobile table (Figures 16 and 17).



17.
Child in position for operative stainless steel crowns in the

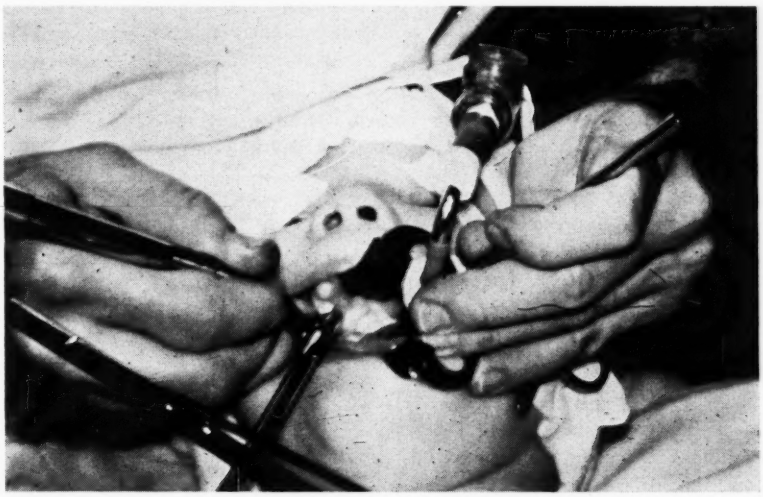


18.
hospital. The implements shown are throat pack, eye guards, oral intubation, mouth prop, and head cover.

tunity for constructive procedures with minimal psychologic trauma to the patient than do stainless steel crowns. A skilled dentist can routinely crown single or multiple primary teeth in 15 to 20 minutes. The obvious advantages of reduced chair time and enhanced remuneration in relation to the treatment completed make steel crowns doubly attractive. No procedure, if inconsistent with strict professional standards of quality or if inconsistent with fair fee management will be acceptable to specialists or general practitioners. Stainless steel crowns are consistent with both of these principles.

(End of Part One)

504 *Carver Building*



19.
Operator in position at the operating table for performing stainless steel crown technique.

The Role of the Roentgenogram in the Diagnosis and Prognosis of Periodontal Disease

JOHN PRICHARD, D.D.S., Fort Worth, Texas

Limitations of Roentgenograms

The limitations of dental roentgenograms in the diagnosis of periodontal disease are as follows:

1. Roentgenograms do not show the periodontal pocket.

2. They do not specifically distinguish between the successfully treated case and the untreated case.

3. They do not record the morphology of bone deformities.

4. They do not show the anatomic structures on the buccal or lingual aspects of the tooth.

5. They show no soft-to-hard tissue relationship.

6. They do not record tooth mobility.

From Oral Roentgenology, *Oral Surgery, Oral Medicine, and Oral Pathology* **14**:182 (Feb.) 1961.

An Amalgam Technique:

CONTROL OF RESIDUAL MERCURY CONTENT

PETTER SKJORTEN, D.D.S., Askim (Oslo) Norway

DIGEST

Proper control of the residual mercury content is of great importance in the fabrication of a satisfactory amalgam restoration.[1,2,3] The author of this article has devised a small, simple apparatus which he calls a mercury eliminator. The article describes a technique in which the eliminator is used to control the mercury content within a definite and favorable limit.

Variation in Technique

The technique presented here differs somewhat from those commonly used, especially in regard to the treatment of the amalgam before condensation in the cavity:

(1) All excess mercury is removed from the triturated amalgam before condensation is started.

(2) The removal is done in one operation, and the amount removed is controlled by weight.

Removal of Excess Mercury—A mechanical condenser and a small apparatus called a mercury eliminator (Figs. 1 and 2) are used. The eliminator is made of iron which does not attract mercury and consists of a tube (a) into one end of which is screwed a mouthpiece (b). The free end is crater shaped (c); from the bottom of the crater a central hole has been drilled through the tube (d).

Mechanical Parts: (1) Guided by a screw in the other end of the tube (e), a piston (f) extends through the tube and a short distance into the mouthpiece.

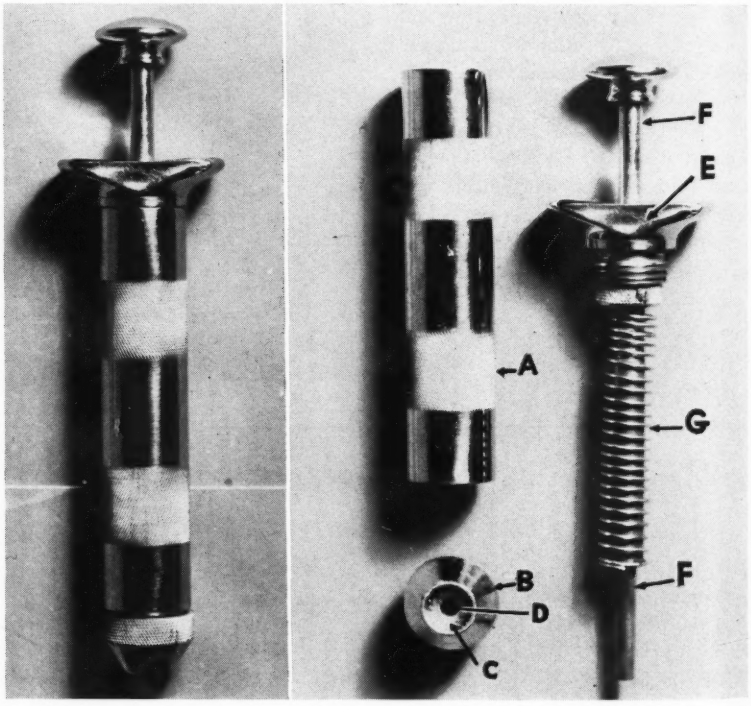
(2) The bottom of a cylindrical chamber is thus formed in the forward part. The piston is held in position by a spiral spring (g), and the depth of the chamber can be changed by turning the mouthpiece.

(3) The diameter of the chamber is 4.3 millimeters. The triturated amalgam is condensed in this chamber. The condenser point used is round and plate shaped and has a diameter of 4 millimeters.

Mercury Transpired: The excess mercury will transpire between the point and the wall of the chamber.

Weighing Procedure—A Crandall balance with some modifications is used for weighing. The distance between each line has been divided into 5 equal parts (Fig. 3). This division makes the weighing safer and more correct. To facilitate the use of the balance an arm has been added to the front. The arm ends in a horizontal plate on the same level as the upper edge of the scale when the balance is in equilibrium (Fig. 4a).

For the alloy used, the ratio alloy-



1. (left)
The mercury eliminator is shown. The eliminator is made of iron which does not attract mercury.

2.
The various parts of the mercury eliminator: (a) tube; (b) mouthpiece; (c) crater-shaped free end; (d) central chamber; (e) screw guiding the piston; (f) the piston; (g) spiral spring which holds the piston in position.

[1]Phillips, R. W., and Boyd, D. A.: Importance of Mercury-alloy Ratio to Amalgam Fillings, JADA **34**:415 (April) 1947.
[2]Phillips, R. W., and Swartz, L. M.: Mercury Analysis of One Hundred Amalgam Restorations, J. D. Res. **28**:569 (December) 1949.
[3]Phillips, R. W., and Swartz, L. M.: Residual Mercury Content of Amalgam Restorations and its Influence on Compressive Strength, J. D. Res. **35**:458 (June) 1956.

mercury-excess mercury, 5-7-2, has been found to be satisfactory. Consequently, when 4 parts of alloy are needed, the corresponding figures are 5 3/5 and 1 3/5. The consistency of the amalgam obtained is well suited for mechanical condensation. (In order to study the effect of the mechanical condenser on amalgam containing different amounts of mercury, innumerable restorations were completed, and the cavities prepared in transparent acrylic.)

Procedure for Amalgam Restoration

When making an amalgam restoration, requiring for instance 5 parts of alloy, the procedure is the following:

1. The alloy and mercury are weighed, and the weight is placed on the balance on line nr 2. Trituration is started. This is done with mortar and pestle. The N.T.F. alloy used amalgamates rapidly,[4] and the trituration takes a maximum of 30 seconds.

2. The triturated amalgam is transferred directly to the chamber in the mercury eliminator. About 20 seconds are needed for this.

3. The assistant holds the mercury eliminator over the balance (Fig. 4). The amalgam is now condensed to remove the excess mercury.

4. To prevent particles of mercury from adhering to the head of the condenser, a bit of rubber dam has been placed on the neck of the plugger (Fig. 4b).

5. The excess mercury will collect in the scale; when the balance has reached horizontal position the extrusion of the mercury is completed. For this condensation about 10 seconds are required.

6. In one operation all excess mercury has been removed from the triturated amalgam; the time required for trituration and removal of the excess is about 1 minute.

3.
The distance between the original lines divided in five equal parts. (The new lines have been made by means of a stamp to prevent loss of material.)

Completion of Amalgam Restoration

1. The amalgam is pushed out of the chamber by means of the piston, and a quantity is placed in the cavity. Meanwhile the assistant has exchanged the plugger for one of the two shown in Figure 4. These condenser points are considerably smaller so that the amalgam will be softened during condensation and adapt readily to the cavity walls and margins. No additional mercury need be removed during condensation. The operator may concentrate entirely on the condensation procedure.

2. The condensation of a restoration will require an average of approximately 2 minutes.

3. The triturated amalgam is usually divided into three parts. Due to the short time required for condensation and to the fact that all excess mercury has already been removed, the two latter parts are not harmed by the standing. It should be remembered that amalgam should never be touched by hand.[5]

4. Overpacking is not required, but there must be enough excess material to permit proper carving and polishing of the restoration. The matrix may be removed immediately, but great care should be taken in its removal.

5. Hand condensation is never used since it has proved to be unsatisfactory for working with amalgam previously freed from excess mercury.

6. The plugger is not changed during condensation as the pressure applied to the condenser would have to be altered in order to obtain a dense and homogeneous restoration.[6]

7. The condenser point is fastened in the condenser in such a manner that it is permitted to rotate. It will then reach into the corners of the preparation.

8. A Midwest condenser has proved entirely satisfactory for employment with this technique. It is possible that a condenser in which the strength of the blow could be regulated might be even more desirable.

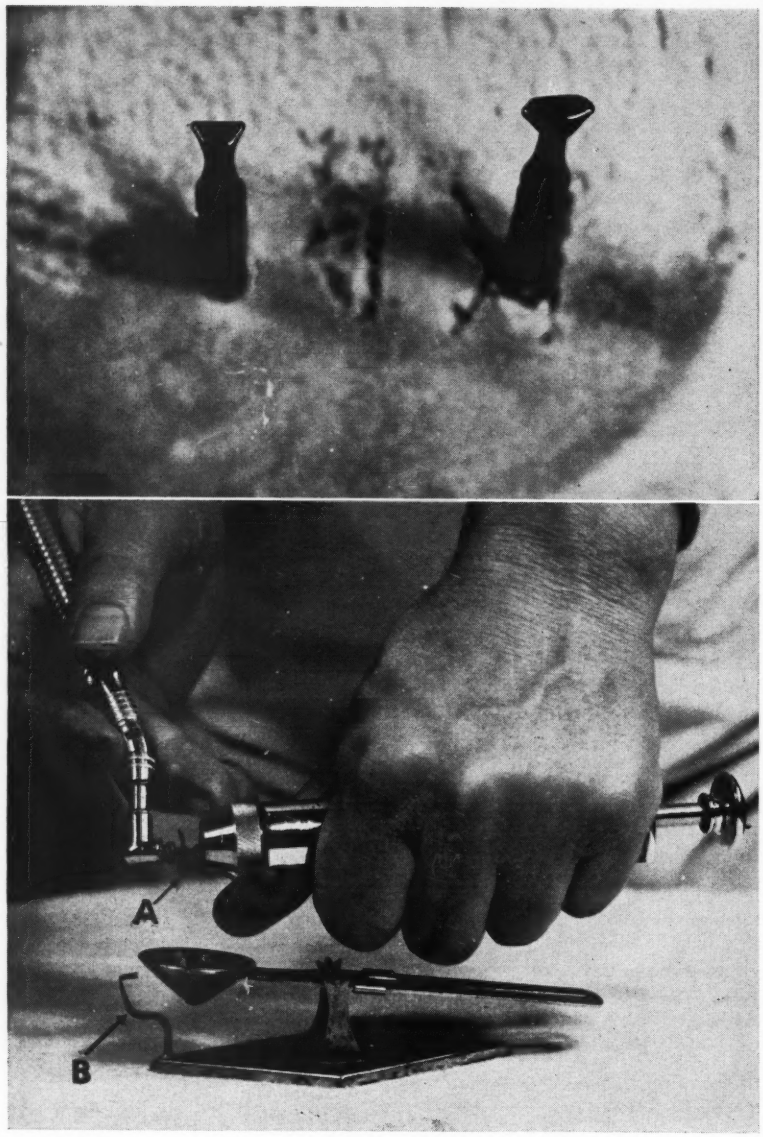
Useful Measures

Restorations in this technique are rarely made so large that they can not be fabricated from only one mix of amalgam. For large and complex cavities castings are preferred. Occasionally, however, a large restoration is made in two sections, giving the first part time to crystallize completely before adding the second portion.

Composition of Alloy—The alloy used has the following chemical composition: silver 67.9 per cent, tin 26.7 per cent, copper 4.4 per cent, and zinc 1 per cent. It has been tested by the National Bureau of Standards with the following results: Crushing strength 49,200 pounds to an inch,[2] flow 3.2 per cent, and setting change 4.6 microns.[7]

Strength of Restorations—No data are available showing the effect of the

[4]Meddelelser fra sekretariatet: N.T.F. is amalgam. Den Norske tannlaegeforenings Tidende. Hefte 5. (Mai) 1954.
[5]Phillips, R. W.; Swartz, L. M.; and Boozayaangool, R.: Effect of Moisture Contamination on the Compressive Strength of Amalgam, JADA 49:436 (October) 1954.
[6]Phillips, R. W.: Physical Properties of Amalgam as Influenced by the Mechanical Amalgamator and Pneumatic Condenser, JADA 31: 1308 (Oct.) 1944.
[7]The National Bureau of Standards, Washington, D. C.: Report No. 1942.



4. (top)
Points used for condensation of the restoration.
5.
The position is shown of the mercury eliminator during condensation of the amalgam for removing and weighing excess mercury.

technique on crushing strength, but these restorations would appear to be unusually strong. Doctor Salomonsen, of Stockholm, has measured the effects on flow and setting change, and found the figures to be 3.2 per cent and +6 microns respectively.

Amalgam Technique Standardized—For the alloy used, the term "Excess Mercury" has been given a fixed value. This may be expressed as a definite percentage of the weight of the triturated amalgam. The residual mercury content of the restoration will consequently have a corresponding value. With the ratio 5-7-2 this value will never exceed 50 per cent. By carving, the percentage will be slightly reduced. This has been confirmed by R. W. Phillips[2] who has run mercury analysis on some restorations packed in the described manner.

It has been shown that if residual mercury content in amalgam restorations exceeds 55 per cent, inevitably there will be a marked loss of strength.[3]

Advantages of Technique

All restorations packed with this technique will have nearly identical mercury content, probably evenly distributed throughout the restorations. They will take a high lustre and seem little disposed to tarnish and corrosion. Nor do the restorations blacken the teeth. Pitting or lamination has not been observed in restorations placed by this technique.

The technique is easy and simplifies the manipulation of the amalgam by saving time and reducing the number of instruments needed.

Fast setting alloys are not recommended for this method.

This technique has been used by the author since 1947; thousands of amalgam restorations have been completed each year. When properly used, the technique gives excellent results.

Askim, Norway

A New Chemotherapeutic Approach to the Treatment of Gingival Tissue

(*Continued from page* 228)

benzalkonium chloride for the destruction of bacterial invaders. Because of the possibility of the development of systemic bacteremias from infectious periodontal conditions, the formulation is valuable for its effectiveness in controlling and eradicating such conditions.

2. The clinical observations can be summarized as follows:

(a) With fifteen cases of acute Vincent's infection, fourteen favorable responses were obtained.

(b) With twelve cases of infectious stomatitis, nine favorable responses were obtained.

(c) With twenty-two cases of periodontitis, twenty-two favorable responses were obtained as manifested by the alleviation of inflammation, swelling, and pus.

D. C. General Hospital (A.M.)
George Washington University (S.M.S.)

The EDITOR'S Page

ANY DEVICE that will reduce the dangers of radiation injury is worthy of investigation. One such device is described in an article in this issue (page 218). The attention of dentists is directed to an appraisal of this instrument.

Although x-rays have been used in dentistry for more than a half-century this diagnostic procedure has gained in popularity the last 30 years. The inherent danger in radiation has been known for years, but increased attention to the hazard has been emphasized since the development of nuclear fission. Man-made radiation plus cosmic rays, that have been present since the beginning of time, have focused interest on the potential dangers in all forms of ionizing radiation: dangers to germinal and somatic cells.

Most of us are not well enough trained in physics to understand the complex problems of radiation. We use x-ray machines with varying degrees of skill, but have been indifferent to the details of the phenomena involved. A recent book written by a dentist is commendable for an extremely clear presentation of the principles of ionizing radiation and for practical suggestions to dentists on means to reduce the dangers.[1]

Wuehrmann states the case bluntly:

"The effects of radiation are accumulative and irreversible; thus wide margins of safety are essential until man's knowledge becomes more exact. It is of paramount importance that the dentist understand his obligations to society. As will be pointed out in this book, if ordinary precautions are taken, the total amount of radiation contributed by dentistry to the reproductive cells is not great. However, since all radiation is accumulative, any *unnecessary* radiation, *however small*, contributed by members of the dental profession must be eliminated. Dentists are their own 'roentgenographic specialists.' In contrast to medicine, dentistry has at present few qualified radiologists. Each dentist must therefore accept his share of the profession's responsibility . . .

"The disadvantages of injury caused the patient through the diagnostic use of x-radiation in the dental office is overshadowed by the advantages gained through the use of the diagnostic film, provided that the dentist minimizes the total exposure as much as possible."

The dentist himself is more endangered by x-ray radiation than is his patient. The dentist is exposed frequently to both the primary and secondary rays. He or his assistant should never stand in the path of the primary beam and under no circumstances should he or his assistant hold a film during exposure. The latent period for x-ray injury to become evident may be as long as 25 years.

One of the simplest safeguards to reduce the danger of radiation is to use high-speed dental films. Wuehrmann makes this flat statement of fact:

"*Fast films per se more effectively reduce radiation of the patient than does any other single factor.* Films, together with additional filtration and collimation, can reduce the skin dose to the face as much as 89 per cent. All possible means for reducing exposure should be employed." Collimation is a technique or mechanism for reducing the spread of radiation to a predetermined diameter. The device described on page 218 concentrates the x-rays on the target area.

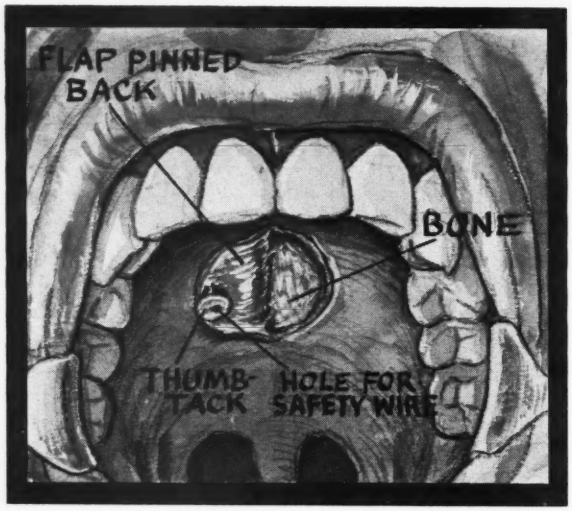
Every dentist who uses x-rays (and every progressive dentist should) is morally and legally responsible to his patient to assure him that the good of this service outweighs any possible harm. Fortunately, if the dentist understands the problem as stated clearly by Wuehrmann and erects safeguards that are suggested by him the advantages of x-rays are significantly greater than the potential hazards.

The dentist must constantly be aware of the dangers to himself and to his office personnel that are involved. Simple precautions will reduce these grave hazards: He should avoid exposure to the direct ray as he would the plague by always standing at right angles to the direction of the beam.

The x-ray if used improperly is a lethal weapon. When used properly it is a boon to mankind. Dentistry would regress to a primitive status if x-rays were not available.

[1]Wuehrmann, Arthur H.: Radiation Protection and Dentistry, St. Louis, C. V. Mosby Company, 1960.

Clinical and Laborator

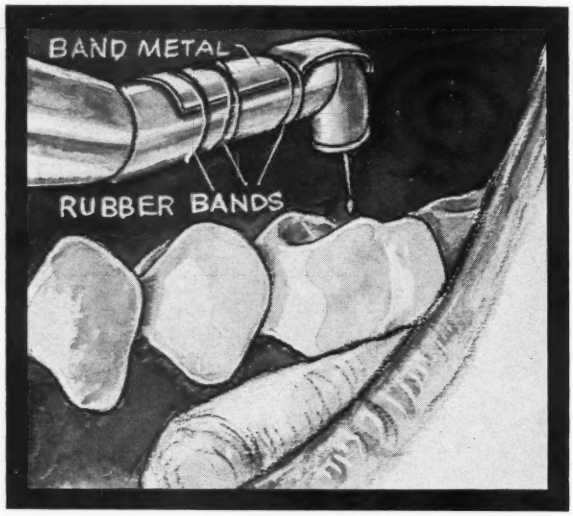


1

Thumb Tack Retractor

S. L. Drummond-Jackson, L.D.S., London, England

1. For minor surgery in the palatal area cast a thumb tack in precious metal with a hole for a safety wire. The surgical flap is turned back and pinned with the tack.

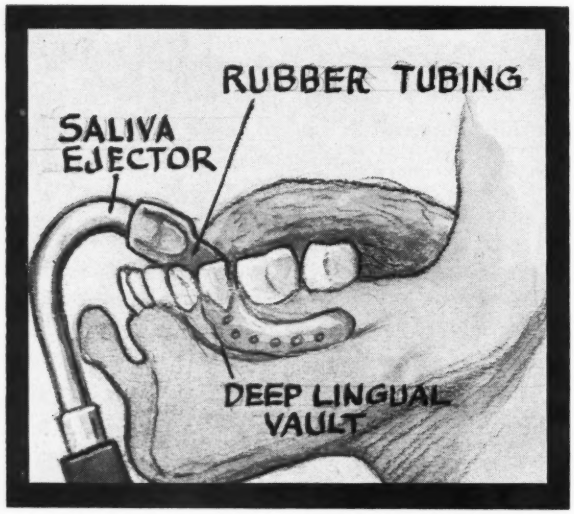


2

Air-Rotor Handpiece Shield

S. M. Hutchinson, D.D.S., Brooklyn, New York

2. To protect the opposing teeth from the air backblast exhaust from an air-rotor adapt a piece of metal matrix band material to the handpiece and hold it in position with small orthodontic rubber bands.



3

A Functional Saliva Ejector

Lawrence Wiland, D.D.S., Flushing, New York

3. Perforate a piece of rubber tubing and place it on the head of the saliva ejector. This rubber tube extension will conform to the floor of the mouth and will be more functional and comfortable for the patient.

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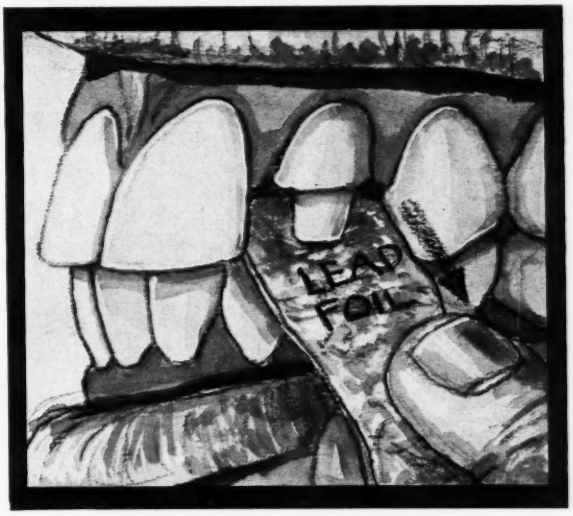
SUGGESTIONS . . .

Gauge to Determine Occlusal Clearance

Ben E. Pleshette, D.D.S., New York

4. Cut a piece of lead foil, from an x-ray film, the width of the tooth that is to be tested for occlusal clearance. If the foil can be drawn back and forth without binding the bite is free from interference at that thickness of foil. The thickness of the foil may be increased for the desired amount of clearance.

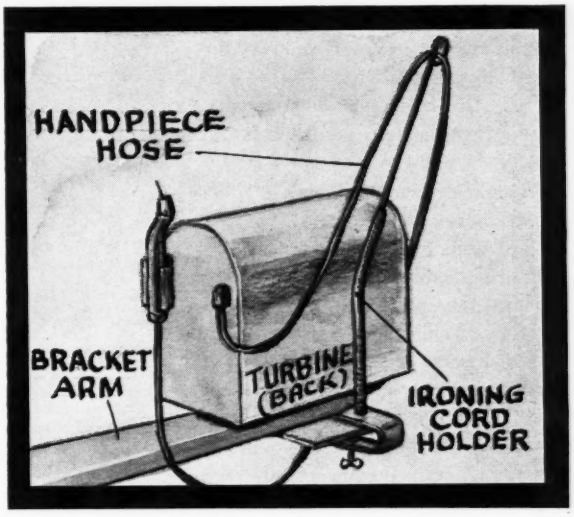


4

Air Turbine Hose Holder

Joe J. Simmons, D.D.S., Dallas, Texas

5. An ironing cord holder attached to the base of the air turbine bracket mount will keep the air hose out of the way of the patient.



5

Eliminating Gagging During X-ray Exposure

Aaron Peck, D.D.S., Cincinnati

6. Have the patient take a few deep breaths. Instruct him to hold his breath while the film is placed in position and exposed.

6

volved: and jot down the advantages of the technique. This shouldn't take ten minutes of your time. Turn to page 244 for a convenient form to use.

Send your ideas to Clinical and Laboratory Suggestions Editor, DENTAL DIGEST, 708 Church Street, Evanston, Illinois.

MEDICINE and the Biologic Sciences

Diabetes—Oral Drug Therapy

The exact mechanism of oral hypoglycemia agents has not been clearly established. In all probability, the hypothesis that glycosuria is corrected and blood sugar lowered by increased production of insulin is unsound. The drugs should not be considered necessities but, when effective, are more convenient than insulin. In some cases better control may be afforded.

Approximately 80 per cent of adult diabetic persons are overweight before treatment. With proper diet, obesity will be lost and the diabetes controlled. Often in these patients, oral therapy is attended by further gain in weight because appropriate changes in diet are not made. Temporary use of oral agents until dietary restrictions are effective is justified but the drugs should never be used as substitutes for diet.

Juvenile diabetes occurring in either children or adults accounts for 10 per cent of patients. The remaining 10 per cent of patients are theoretically ideal for oral therapy. They are not overweight and may even be underweight. The disease is acquired in adult life, and drugs, either insulin or one of the oral preparations, are required for control. Two-thirds of these patients can be maintained satisfactorily with oral therapy. Women respond better than men.

Therapeutically, metahexamide is considerably more potent in lowering blood sugar than chlorpropamide, which in turn, is more potent than tolbutamide. Metahexamide is also effective at lower blood concentrations than either chlorpropamide or tolbutamide.

When two doses of tolbutamide are needed each day, one is given at breakfast and one at lunch. This allows the greatest effect during the period when three meals are consumed in close succession, and a waning effect during the night when no food is taken.

A single dose of chlorpropamide before breakfast lowers the blood sugar throughout the twenty-four hours. Because of this, nourishment is given at bedtime to protect against hypoglycemia in the early morning. Nothing is gained by combining sulfonylurea with insulin.

Jaundice has occurred as a side effect of metahexamide therapy but is rare when the dosage is kept below 0.25 gram daily. The reaction subsides promptly on withdrawal. Anorexia and personality changes in patients receiving sulfonylurea compounds are controlled when oral therapy is discontinued. If only partial control of hypoglycemia is achieved, oral therapy should be abandoned in favor of insulin.

Duncan, Garfield G.: Symposium on the Hypoglycemic Agents, Metabolism **8**:684-686 (June) 1959.

Accidents Among Old Persons

Old persons are prone to accidents. This is due to physiologic, pathologic, and psychologic changes of aging as well as environment. Contributory physiologic alterations are deterioration of sensory motor performance leading to prolonged reaction time, failing vision, diminished hearing, gradual loss of taste and smell, poor coordination, and muscular weakness. Also the old person's liability to accidents is increased by pathologic changes of aging such as osteoporosis, cerebral arteriosclerosis, deformed feet, labyrinthine disorders, and varied illnesses.

Elderly persons may stubbornly insist that their ability to climb, lift, and pull is undiminished. This attitude in elderly men frequently results in industrial mishaps. Some old people refuse to correct reckless habits. Forgetfulness, absent-mindness, disinterest, and failure to sustain attention also impose dangers.

As a result of acquisitiveness, homes of old people may be congested and consequently, hazardous. Small quarters, poor lighting, loose rugs, highly polished floors, trailing electric cords, and narrow staircases with high treads are particularly perilous for the aged. Poor design and structural maintenance of homes also contribute to the high casualty rate.

The greatest incidence of pedestrian accidents among adults is in the seventh decade. Fatal pedestrian accidents among the old are most frequent in the age group of 75 to 79 years. For all forms of traffic disasters, accident and death rates are high in persons who are over 70 years of age.

Industrial accidents are actually less common in old people than in younger groups, probably because the elderly are engaged in less dangerous employment. In old persons, the lesions usually result from falls or from blows by moving objects.

Most of the injuries occur in the home since this is where old people spend the most time. Fatal home accidents are commonest among persons over 65 and are more frequent among women than among men. Falls, burns, and scalds, and coal gas poisoning are common accidents. Falls account for nearly 80 per cent of fatalities.

Coal gas poisoning is frequent in the elderly, perhaps because sense of smell is impaired. Approximately 30 per cent of old persons cannot reliably recognize the odor of gas at concentrations below 50 parts per 10,000.

(*Continued on page* 242)

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1. Kuder, H. V.: Clin. Pharmacol. & Therap., *1:*604, 1960.
2. Stephens, V. C., *et al.:* J. Am. Pharm. A. (Scient. Ed.), *48:*620, 1959.

*Base equivalent

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132553

(*Continued from page* 240)

Hospital accidents are commonest among patients over 60 years of age with cardiovascular disease. Most frequent are falls at the bedside. Lack of supervision, high beds, and slippery floors are the main contributing conditions.

The accident rate among old people may be reduced by providing suitable living and working conditions. And, the limitations imposed by the aging process should be appreciated.

Boucher, C. A.: Accidents Among Old Persons, Geriatrics **14**:293-300 (March) 1959.

Lump in the Throat

A lump in the throat should never be dismissed as functional until thorough examination discloses no organic conditions. Examination of the patient with a lump or abnormal sensations in the throat should include palpation of the base of the tongue and investigation of the nasopharynx, pharynx, and hypopharynx. If no organic condition is found, the upper entrance to the esophagus and adjacent structures should be examined.

Inflammation of the lingual tonsils causes pain and discomfort when the patient swallows. The tonsillitis tends to become subacute and may persist for weeks or months. The patient wants to clear the throat or to swallow constantly. Pain tends to be deep in the throat at the level of the hyoid bone. Masses of lymphoid tissue may press on the epiglottis and interfere with swallowing, occasionally producing voice changes.

Hypertrophied lymphoid nodules on the lingual tonsils are best treated by electrocoagulation after local anesthesia. Extremely enlarged masses of lymphoid tissue should be removed by dissection and snare.

With chronic pharyngitis, the hypertrophied follicles and lymphoid tissue obstruct the mucous gland openings and mucus is thick and sticky. This, combined with poor ciliary action in the mucous membrane, makes the patient want to clear his throat constantly. Repeated coughing and hawking aggravate the throat irritation. Microscopically, a gradual increase in connective tissue and hyperplasia of the submucosa are seen. The muscles of the throat become hypertrophied, contributing to the sensation of fullness.

When inflammation is the cause of symptoms, local treatment to the pharyngeal area should be kept to a minimum. The application of strong agents or cauterization of the hypertrophic area of lymphoid tissue is not wise. Frequently all the patient needs is assurance by the physician that the condition is not malignant.

Tremble, G. Edward: The Clinical Significance of a Lump in the Throat, Arch. Otolaryng. **70**:157-165 (July) 1959.

Surgery for the Cardiac Patient

The operative risk is not increased by organic heart disease that does not limit or only moderately limits physical activity. Hypertension itself is not a hazard but associated pathologic changes may be. In every adult with diabetes, hypertension, or myxedema, coronary atherosclerosis should be suspected. The operative risk is greatly increased when coronary stenosis is associated with syphilitic aortitis.

When attacks of angina are increasingly frequent, occur at rest, or do not abate quickly when nitroglycerine is given, coronary thrombosis may be imminent and operation should be postponed, if possible. Acute coronary occlusion and acute myocardial infarction are contraindications to surgery. Operation is permissible, however, in a patient with healed infarction of one and one-half to four month's duration and no sclerosis of other coronary vessels.

Prophylactic operation is seldom justified before valvular stenosis is an actual handicap. The decision for operation rests on the degree of chronic disability, the improvement during medical management, and the deterioration of the patient's condition. Although nonorganic arrhythmias are harmless, those due to organic lesions should be controlled and the ventricular rate brought within normal limits with digitalis and supportive measures. If unconsciousness accompanies heart block, only the most urgent operation should be scheduled.

Preoperative care includes eradication of bacterial and viral infections and extracardial conditions affecting the heart, also improvement of pulmonary ventilation. Patients having received cortisone within three to six months should be given steroid preceding operation. Patients with hypercorticism who have received cortisone within a twelve-month period should be given up to 600 milligrams of cortisone intramuscularly over a period of sixty hours before operation with a final dose of 100 milligrams by mouth one hour preoperatively. Tranquilizing and antihypertensive agents should not be given. Patients who have been receiving insulin should have elevated sugar levels. Anticoagulants should be reduced gradually until prothrombin time is reduced 40 per cent or higher. Patients with adrenal insufficiency should not be premedicated with morphine or phenobarbital.

Heart rate and rhythm are regulated by digitalis. Psychologic preparation of the patient by the internist is important to instill confidence and allay apprehension or excitement.

Medical and surgical consultation with the anesthesiologist will ensure proper premedication and successful management during operation. Generally, the barbiturates should be avoided. Morphine is used in small doses or not at all. High spinal anesthesia should not be used, but low spinal anesthesia may be suitable for prostatic obstruction or uterine operations. Patients with diabetes should not be given ether.

A continuous electrocardiograph record during operation reveals changes in heart action before blood pressure and pulse reactions occur. Signs of cardiac failure, unusual arrhythmias, shock, and hemorrhage should be watched for in the first twenty-four to forty-eight hours after operation. The patient must be prop-

(*Continued on page* 244)

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CLINICAL AND LABORATORY SUGGESTIONS

(*See pages* 238 *and* 239)

Forms to be Used by Contributors

To: Clinical and Laboratory Suggestions Editor

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From:_____

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Subject_____

Explanation of Procedure:

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erly positioned. A liquid or soft diet is given and salt is not restricted. Preoperative medication is continued until the patient is fully ambulatory. A clear airway and adequate pulmonary ventilatory exchange must be maintained.

Griffith, George C.: The Medical Care of the Cardiac Surgical Patient, M. Clin. North America **43**:1037-1047 (June) 1959.

Radiation Injuries

In case of emergency, a large number of patients would have to be treated with only a minimum of personnel. Clinical appraisal and judgment would probably be the most important factors available for some time.

The signs and symptoms of radiation injury fall into four groups:

(1) General: headaches, vertigo, debility, abnormal sensations of taste or smell.

(2) Gastrointestinal: anorexia, nausea, vomiting, and diarrhea.

(3) Cardiovascular: tachycardia, arrhythmia, fall in blood pressure, and shortness of breath.

(4) Psychic: irritability, insomnia, fear.

Patients who receive a supra-lethal dose in excess of 1000 roentgens total body radiation have a poor prognosis. They have a rapid course which usually results in death during the first one to two weeks. The earlier the start of the fever the worse the prognosis and the shorter the course to death. Medical therapy has little to offer other than strong sedation and analgesics. The pathologic process which brings about death is centered in the severe necrosis of the gastrointestinal tract. Those few who might recover will usually succumb to the severe hemorrhagic effects of the thrombocytopenia.

Persons who receive 250 to 1000 roentgens total body radiation have a fair prognosis. Severe nausea and vomiting occur in the first or second day and there is a latent period of several days before the nausea and vomiting recur. The shorter the latent period the worse the prognosis. Bleeding of the gums is noted during the brushing of the teeth at this time and the slightest trauma will bring about a purpuric spot. With proper treatment, a large percentage of the patients will show a gradually improving condition over a period of several months until recovery is evident.

Those receiving 100 to 250 roentgens experience a mild nausea and vomiting on the first or second day. Following a latent period a mild recurrence may be noted. If severe injuries, burns, or fractures are present there is a tendency to delayed healing and a greater tendency toward infection.

Persons receiving less than 100 roentgens may be completely asymptomatic or have a mild transient nausea. Mild sedation is the only treatment indicated and there is no need for hospitalization.

Lofstrom, James E., and Hance, Darwood, B.: The Management of Massive Radiation Injuries, J. Michigan Med. Soc. **58**:1623-1627 (October) 1959.

Chewing Gum as a Vehicle for the Administration of Fluoride: Studies with ^{18}F

R. D. EMSLIE, M.S., B.D.S., F.D.S.; N. VEALL, B.Sc., F.Inst.P.; R. DUCKWORTH, M.B., Ch.b., B.D.S., F.D.S., London

CHEWING gum is suggested as a vehicle for the topical application of fluoride to children's teeth. Essential requirements of such a gum are that sweetening agents should have no cariogenic activity and that there should be a low calcium content.

Formula Used—The formula for a suitable chewing gum used in most of the studies reported is the following:

Special chewing gum base	28
Staybelite Ester N/10	18
Sorbitol	24
Potato starch	28

(*Continued on page* 246)

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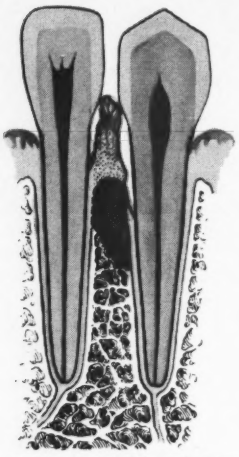

Fig. 46. Destruction of the gingiva due to open contact. (Reduced from size in book.)

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Adapted from Original Communications, *British Dental Journal*, **110**: 127 (February 21) 1961.

Natural Tooth Placement and Base Contour in Full Denture Construction

GEORGE FRANKLIN McGEE, D.D.S.

Conclusions

Since proper vertical dimensions can only be correctly determined (whatever the method) with the use of properly fitted baseplates and contoured wax rims, all the landmarks given for placing teeth may be used to contour the wax rims. Thus, except for their vertical height, the wax rims are almost completed before they are placed in the mouth. This cuts chair time and guesswork to a minimum.

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Improvements in Abnormal Conditions Can be Made—The problem of denture construction has been advanced by characterization of the teeth and denture base tinting, but the full possibilities cannot be realized until we learn to place teeth in their normal, natural positions.

(*Continued on page* 248)

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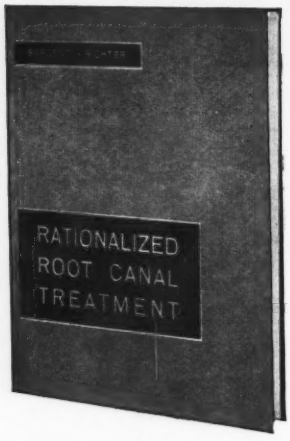

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Adapted from *Journal of The Dental Association of South Africa* **15**: 161 (May 15) 1960.

Contra-Angles

The Therapeutic Value of the Rocking Chair

THE TITLE of this item is lifted intact from an article in one of the most distinguished medical journals, *The Lancet*. At first it may sound like a gag. It is not. People have been using rocking chairs for years—for comfort rather than for therapeutic potency. But isn't comfort a therapeutic virtue?

People who are addicted to the rocking chair are a tranquil lot. I have never seen a nail-biter gnawing in a rocking chair, never heard a shrill voice emitted from one.

The therapeutic virtue of a rocking chair is based on the sound premise that gentle exercise and movements are basic to good health. Anything that makes a person bedridden or inhibits or immobilizes him leads to venous congestion, blood stasis, thrombosis, restricted respiratory movements, muscle wasting, joint stiffness. These hazards are well known to surgeons who insist on early ambulation for their patients.

One likes an author who states his premise and assumptions in clear and orderly fashion; who gets to the point. The case for the effective therapy of the rocking chair is admirably stated by the author (R. C. Swan) of *The Lancet* article:

"It enables all but the most feeble to indulge in limited exercise without regard to time or weather, and in a dignified manner.

"The activity imposed on forearm and calf muscles encourages venous return, and thus increases the cardiac output and circulation generally, and helps the absorption of dependent edema.

"The exercise itself promotes respiration and discourages formation of hypostatic pulmonary congestion.

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" 'Rocking,' psychoanalytically speaking, can be considered a socially acceptable and significant activity, encouraging the individual to take part in home activities and to maintain integration with other members of the family circle.

"Statistics are difficult to obtain on this subject, and it may be that I am mistaken in my views. But they have the merit of original observations made on some forty families seen weekly in their homes in Northern Ontario, over an area equal to Yorkshire. In conclusion it is worth adding that the rocking chair is cheap and easily obtainable, has no side-effects, is nontoxic, and needs no prescription — other than the recommendation of a family doctor concerned with the health of his elderly patients."

I was too dumb at the time to see the therapeutic connection, but one of my grandmothers lived past 90 with the last 25 years of her life spent by choice in the matriarchal throne of her rocking chair. One of her daughters was full of good cheer, vigor, and had a clear mind until she was 92. She was also an addict of the rocking chair.

We have a rocking chair that was made by my wife's great-grandfather. I like it, but seldom have the chance to test its healing powers. It is at our cottage in the country. It is in disfavor among the low, soft chairs of city decor. Men, as we all know, have scant control over such affairs. Now that I have sound therapeutic arguments maybe I will be allowed to haul it from the country for my frequent use. Maybe!

Health Affairs in Red China

When a non-Communist is allowed to enter the People's Republic of Red China it is news. Few visas are issued for such visitors. Although the Chinese protest that they are misrepresented by the Western nations, notably the United States, the Communists in power are sensitive to inquiry and examination. China with its vast population, fervent Communism, and emergent technology is a danger spot to peace.

When a distinguished British physician is allowed to enter Red China and gives his report to the world it is impressive news. Sir Robert MacIntosh spent two months in China and reported his observations before the Society for the Advancement of Anesthesia in Dentistry at the Royal Society of Medicine, London:

Standard of Medicine: "As in most countries this varies enormously and one can see in the large cities examples of the highest standard, while within fifty miles or so conditions are reminiscent of a century ago. The strong influence of politics is not so sinister as a casual mention would suggest. In China, uniquely, two quite different systems of medicine exist side by side—Traditional and Modern.

Traditional Medicine: "The history of every country shows, far back, the

(*Continued on page* 252)

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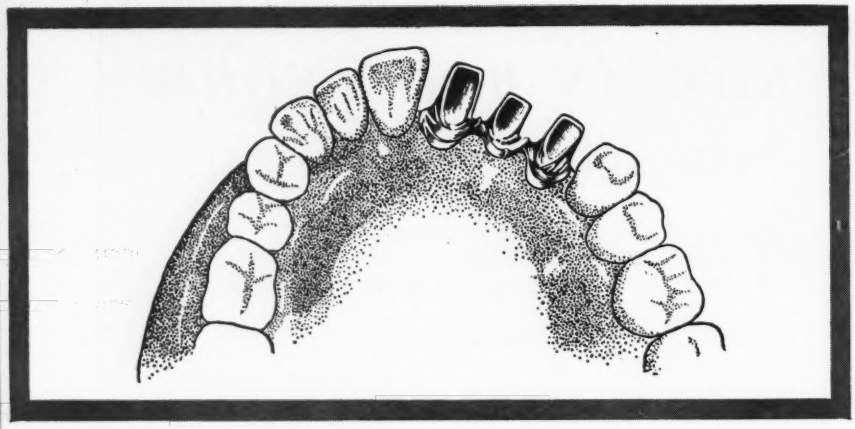

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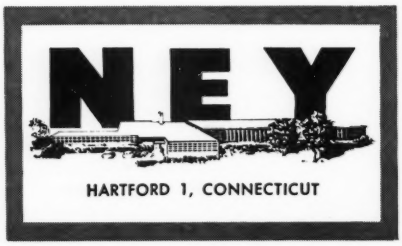

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importance in the community of the medicine man, who even today, though he may be accounted very low by western standards, is held in high esteem by the local people. The great majority of those who are ill get well again whether they have a doctor or not, so the local medicine man gets the credit for appreciable cures just as does his counterpart in the West Ends of the great cities. One can also quote examples of those who did not get well who may have had a chance with the best of modern medicine, and this is inevitable until modern medicine penetrates much further.

Modern Medicine: "In some centers doctors qualified in three years. 'Is this good for medicine?' I asked. I got the answer: 'That is not the right approach—the question is whether it is good for this country.'

"One center gives a fine training of 8 years, some give 6, some 4 and others 3 as mentioned. Once qualified, all seemed to be made equal. This at first did not make sense to me, but the explanation was logical and made me realize that the authorities deserve a little more praise than they get—at least from the West—for the rather courageous and practical way they are attacking some of these herculean tasks.

"In medicine there is no private practice, so the State as employer knows exactly the qualifications of each doctor, and whether he spent 3 or 8 years training. The people in the country must have doctors and they should not be under the impression that they are being looked after any less efficiently than the people in the town. They have therefore made this 'three-year doctor' an intermediary grade between a nurse and a doctor. This man can cope with many emergencies, and is trained to send patients requiring more skilled attention to one of the better staffed centers. These three-year doctors are placed suitably, usually in the country districts.

Dental Practice: "Strangely, in a country so poor, where almost everything has been nationalized in eleven years, some measure of private practice continues. In a few centers, in-

(*Continued on page* 255)

cluding Shanghai, there are excellent dental schools, but their capacity is rather filled with the major operations. The usual training in dentistry is by appprenticeship. After serving as mechanics they are eventually qualified by the local Guild and the political body. Though the work is for the most part private practice, fees are controlled strictly by the local Town Hall. The income is thus under control, and depending on this the amount which is allowed to be spent on new equipment.

Acupuncture: "Acupuncture is one of the three specialities of traditional medicine. Needles are stuck into various places for various effects. This 'needling' is carried out as a treatment for many conditions which we would consider only curable by operation—perforated gastric ulcers and acute appendicitis were examples I saw.

Dental Extractions: "All they did was to stick in a perfectly dry needle from the outside to get anesthesia. One was a little skeptical because of having seen so much done under hypnosis. This lady had needles inserted into her hand and her face, and she did not flicker an eyelid as her teeth were removed. It is of course—but extremely unlikely—that a direct effect could have been obtained on the inferior dental nerve."

Every day brings evidence that Russia and China are developing first-rate technologic capacities and scientific skills. There are hundreds of millions of peasants in these countries; there are also thousands of brilliant and imaginative scientists. At present the talents of these Communists are directed toward preparation for war at the time of their choosing. If these populous countries and these people who are girding for war could be directed toward peaceful uses of their newly developed skills—the improvement of public health standards, for example—the world would be more secure.

A freer exchange of health information and personnel among *all* the countries of the world would be one method that might help avert a catastrophe. The United States can set the example by concentrating on the health affairs of *our own* people and by sharing our knowledge on health subjects with *all* people.—E.J.R.

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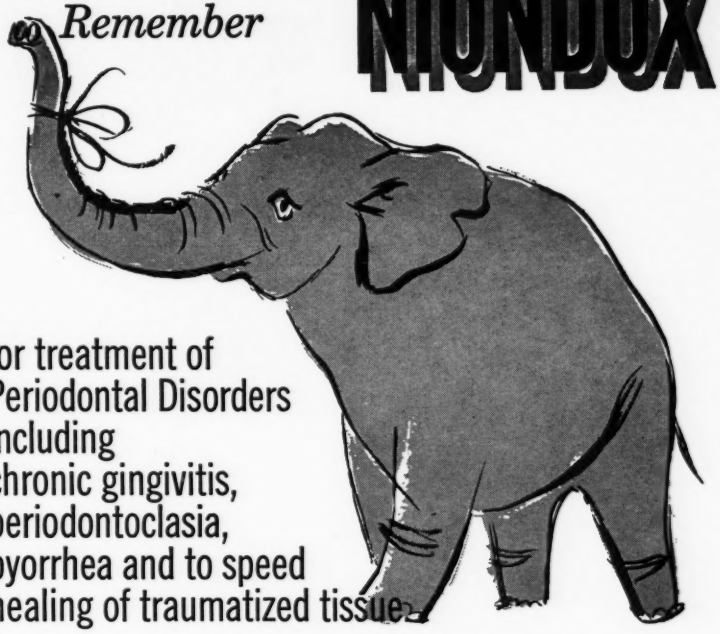

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1. Toff, J. W., Internat. Den. Congress, Venice, Sept. 5-11, 1955.
2. Wellensich, E. K., Texas Dental Journal, 62:259 (1956).
3. Ibid.

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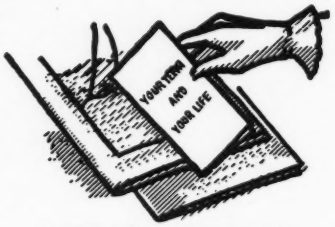

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